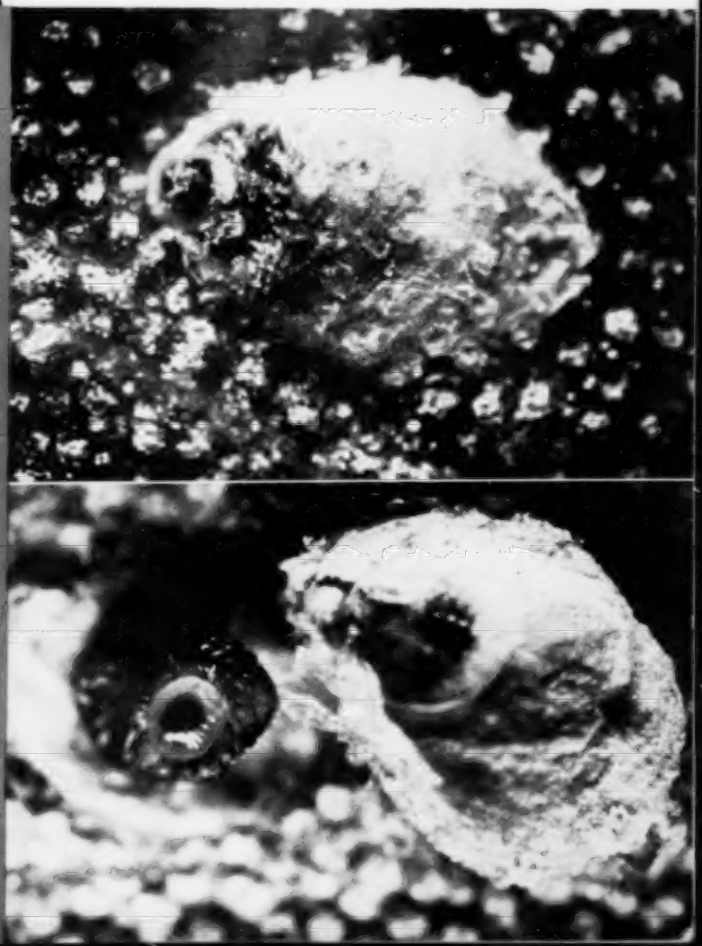
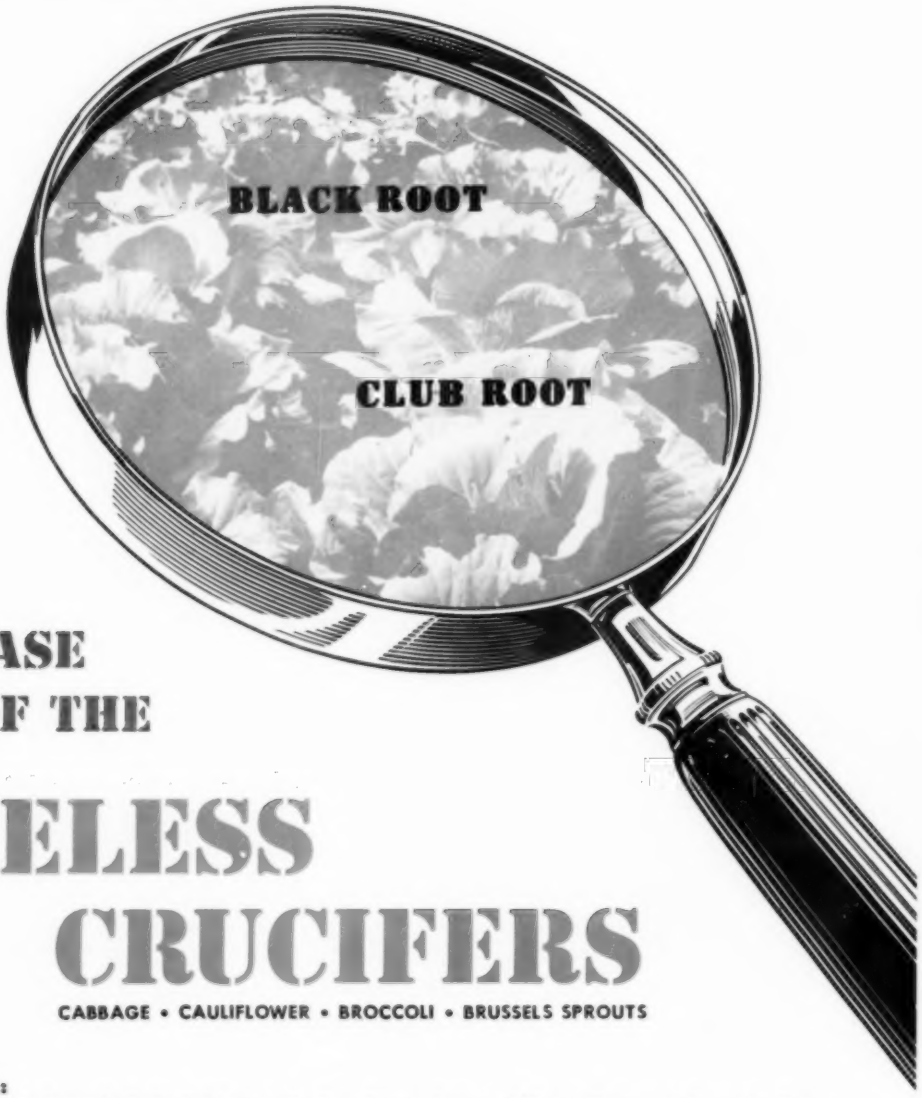
AGRICULTURAL *Chemicals*

IN THIS ISSUE:



November 1956

There's a Fungus Among Us



THE CASE OF THE CARELESS CRUCIFERS

CABBAGE • CAULIFLOWER • BROCCOLI • BRUSSELS SPROUTS

Verdict:
County Court of Appeals finds Cabbage, Cauliflower, Broccoli, and Brussels Sprouts GUILTY as charged...guilty of growing in soil that is untreated by TERRACLOR—Olin Mathieson's new fungicide for certain soil-borne diseases . . . available as 10%, 20%, and 40% dust...75% wettable powder . . . 2 lb. emulsifiable. Mercy is not recommended since one application of TERRACLOR is often effective from planting time to crop maturity.

Sentence:
To be afflicted by the soil-borne diseases club root and black root...Potatoes, Alfalfa, Clover, Green Beans, Lettuce, Wheat, Cotton, and certain Ornamentals are also cautioned against growing in soil that's not treated with TERRACLOR lest they succumb to such soil-borne diseases as scab, damping-off, crown rot, root and stem rot, leaf drop, bottom rot, and common smut. Write for descriptive literature.

Terraclor

OLIN MATHIESON CHEMICAL CORPORATION
INSECTICIDE DIVISION • BALTIMORE • LITTLE ROCK

TERRACLOR® is a trademark

4475

MATHIESON

Aldrin • BHC • Chlordane • DDT • Dieldrin • Endrin • Ferbam • Grain Fumigants • Heptachlor • Lindane • Malathion • Omazene
Parathion • PCP • Phosdrin • Phytomycin® • Rotenone • Seed Protectants • TEPP • Toxaphene • Weed and Brush Killers

Formulators are in sharp disagreement with the opinions of this anti-social aphid.

Tackles Troublemakers. Attaclay is the carrier and diluent that helps you lick stickiness . . . heaviness . . . lumpiness—three troublemakers for the producers (and users) of dust bases, wettable powders, and finished dusts.

Primary Processors like the great fluidity of Attaclay, as received. Its super-sorptivity eases grinding steps—makes it a "natural" for liquid impregnation—keeps dusts on the move through materials handling equipment—delivers dry, free-flowing premium-grade products.

Blenders start off ahead of the game if they use flowable Attaclay-formulated dust bases . . . and stay ahead by using Attaclay as extender and conditioner.

Growers are pleased at the way Attaclay-based powders disperse and suspend in spray tanks; the way dusts flow, disperse, settle, cover, stick and kill.

NEED A HAND in the form of literature, samples, technical help? Use the handy coupon for fast M & C service.

"BUY EARLY"—*makes good sense to processor, dealer, grower.*

ATTAPULGUS **ATTAPULGUS PRODUCTS** *from*

MINERALS & CHEMICALS CORPORATION OF AMERICA

9 ESSEX TURNPIKE, MENLO PARK, NEW JERSEY

ALWAYS A BETTER WAY...

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- ☐ Complete, up-to-date technical literature
- ☐ Free sample of Attaclay

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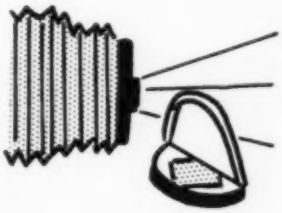
company _____

address _____

city _____ zone _____ state _____

AGRICULTURAL Chemicals



Cover Photo

First and second place winning photos in color division of Insect Photo Salon held in conjunction with recent meetings of the Entomological Society, Pacific Coast Branch. See story, page 38.

MEMBER AUDIT BUREAU OF CIRCULATIONS

Vol. 11, No. 11 November, 1956

AGRICULTURAL Chemicals

ARTICLES

FEATURES

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LIVESTOCK PARASITES

IT'S during the winter months that biting and blood-drinking lice torture dairy herds and beef cattle.

Easiest, quickest way to control these annoying pests is to treat livestock with Pyrenone* fly spray, either oil-based or emulsion type. It not only rids the animals of flies and lice, but Pyrenone won't show up in milk and meat—even after repeated applications.

For *dry* control of lice, during cold weather, many dairymen prefer to use Pyrenone parasite powders. A decided advantage is the fact that the powders are equally effective against *resistant* rat fleas and roaches in food rooms.

Of course, the best recommendation for cattle grubs is an application of always-dependable rotenone—either as a dust or as a suspension for use in power sprayers. Rotenone also kills irritating lice and ticks.

For complete information on special products—such as, rotenone-*butoxide* emulsions, general purpose parasite powders and Pyrenone liquid dressing for show animals—write the nearest office of Fairfield Chemical Division, Food Machinery and Chemical Corporation. Branches in Principal Cities. In Canada: Natural Products Corporation, Toronto and Montreal.

*REG. U.S. PAT. OFF. F.M.C.

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FMC CHEMICALS INCLUDE: WESTVACO *Alkalis, Chlorinated Chemicals and Carbon Bisulfide* • BECCO *Peroxygen Chemicals* • NIAGARA *Insecticides, Fungicides and Industrial Sulphur* • OHIO-APEX *Plasticizers and Chemicals* FAIRFIELD *Pesticide Compounds and Organic Chemicals* • WESTVACO *Phosphates, Barium and Magnesium Chemicals*

IT'S HERE!

A NEW MID-WEST PLANT MAKES FAST, LOW-COST DELIVERY POSSIBLE. ORDER NOW—SAVE MONEY!

There are two big reasons why you should sign *now* with Sinclair for your nitrogen solutions, anhydrous ammonia and aqua ammonia requirements.

First – the completion and opening of a centrally-situated new plant in Hammond, Indiana, means substantial savings on freight charges for most Mid-West nitrogen users.

Second – your seasonal supply problem can be solved by this plant's vast capacity... products will be delivered when you need them to meet *your* production schedule.

Let Sinclair help you solve your nitrogen supply problems and save you money in the bargain. Phone or write...

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(Affiliate of Sinclair Refining Company)

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- ☐ We are interested in Example 1.
- ☐ We are interested in Example 2.
- ☐ We are interested in both examples.

NAME OF COMPANY

ADDRESS

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PRODUCT MFD

We have the bags and the packer to effect such savings — *or more!*

Give us the time to give you the facts!

Dependable as a service for 3 generations. Exclusive Sales Agents for the Kraftpacker Automatic Filling Machine and one of the largest integrated producers of multiwall bags with plants in St. Marys, Georgia and Gilman, Vermont, manufacturing every type of multiwall bag in use today!

Walter Winchell accepts gift of $25,000 from Ralph G. Martin, president of Real-Kill, Inc.

Offers $25,000 for a bug—No Takers!

Despite nation-wide publicity, no one was able to claim $25,000 reward offered by "Real-Kill" for an insect that could not be killed by their new spray.

They have awarded the purse to Walter Winchell for the Damon Runyon Cancer Fund.

No contest was needed however to prove "Real-Kill" is highly effective. It is extra-potent because of Penick's synergist:

SULFOXIDE

Sulfoxide is available in a form suitable for your formulations, too. It will save you money and make your pesticides more effective. We'll be glad to send technical data, price and delivery information.

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Agricultural Chemical and Insecticide Division

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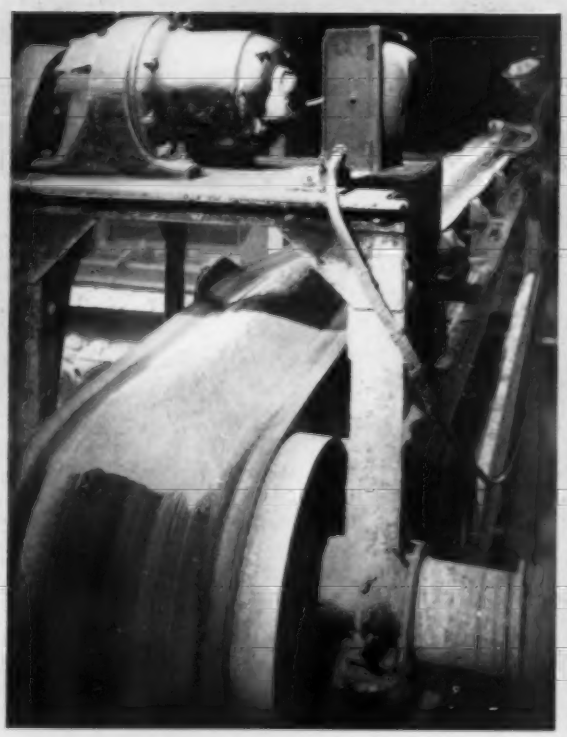
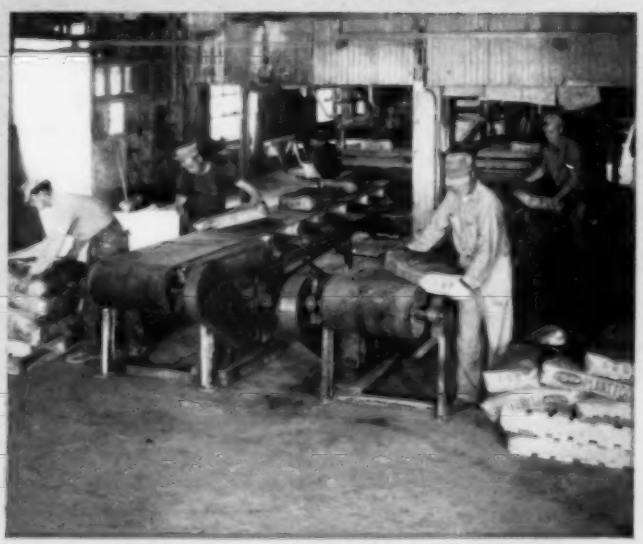
Even after months of storage . . .

"Your triple crumbles like a cookie"

Mr. A. H. ROFFERS, *General Manager* (left) and Mr. W. E. JONES, *Manager* of the Fertilizer Division, Northwest Co-op Mills, Inc., St. Paul, report storing up to 7,500 tons of triple without adverse results.



International's triple goes into more than 20 different mixed fertilizers formulated by the Northwest Co-op Mills. Mixed goods are conveyed by belt to one of 26 bulk storage bins.



Mixed goods produced in the two plants are bagged and sold under the Northwest Co-op name. The fertilizer division, along with feed and seed divisions, serves farm customers in a 5-state area.

"... and saves us 50% on shipping costs"

LIKE all fertilizer manufacturers, Northwest Co-op Mills, Inc., are interested in a top-quality triple that stores with a minimum of setting up. In addition, they want to keep a tight rein on triple super shipping costs.

That's why this modern midwestern firm is an enthusiastic user of International's triple in their two plants at Winona, Minn., and Green Bay, Wis.

"We can store as high as 7,500 tons at a time, and the triple keeps in good condition," says Bill Jones, manager of the co-op's fertilizer division.

The triple goes into more than 20 different fertilizer formulas for co-op customers in Wisconsin, Minnesota, Iowa and the Dakotas.

And International helps hold shipping costs to a minimum too. "We realize 50% savings in transportation costs by International's system of barge shipments through the Gulf of Mexico and up the Mississippi River to Winona," adds Jones.

These big savings in shipping costs are made possible by International's new concept of fast, efficient service. Here's how International's barge shipments, combined with an "on-site" warehousing plan, can help you realize big savings in shipping costs too.

By warehousing triple at storage points located in primary marketing areas, International can assure quick service . . . relieve off-season storage loads at your plant site . . . provide better distribution during peak season.

This new warehousing program includes storage facilities in the St. Paul-Minneapolis area, and three proposed storage sites to be located in key transportation centers. In the areas served by these points, this new service will mean quick, dependable delivery . . . ranging from 24 hours to 3 days.

If you are not already an International user, put us to the test.

You'll find that International's is the triple with built-in extras that help you cut costs. Natural-curing for a minimum of 5 weeks gives you better control of manufacturing conditions . . . helps simplify your formulation problems. And you'll get the extra benefits of a guaranteed constant minimum of 46% APA.

Write or wire International Minerals & Chemical Corporation for full information on prices, shipping and warehousing arrangements.

MINERALS International CHEMICALS

PHOSPHATE CHEMICALS DIVISION

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

General Offices: 20 North Wacker Drive, Chicago 6

In the Spotlight this Month

- **Sprays vs Dusts . . .** Agricultural chemical manufacturers counseled to push the sale of sprays rather than dusts. Speaker at WACA meeting cites advantages which include lower bulk, reduced drift, improved distribution, lower application cost and fewer limitations on application time. See pg. 42.

- **Come-back for Surfactants . . .** Application of surfactant-treated fertilizers to crops found to give yield increases and positive animal taste preference. A report by James E. Seymour of Illinois Farm Supply Co. Pg. 93.

- **Boll Weevil Resistance . . .** The experts disagree on whether the boll weevil is actually developing resistance to pesticides. South Carolina investigators say "yes," while North Carolina has as yet found no such evidence and suggests that cause of reduced control may be poor application, wrong timing or inferior materials. Details in C-V PFA meeting story pg. 43.

- **"Don't Use Chemicals Because" . . .** Why don't farmers use more agricultural chemicals? The answer in many cases, farmers themselves say, is that the subject has been made needlessly complicated. Many farmers are confused,—don't know what to use or how to use it. A symposium on the subject highlights the annual meeting of the Canadian Agricultural Chemicals Association, pg. 55.

- **Cattle Tick Control . . .** Eradication of ticks in Africa is not possible for the forseeable future: because of the economics of that country, and because of limitations of present chemicals. On a theoretical basis, weekly dipping throughout the year in a high concentration of toxaphene would afford very good control of all tick species. Pg. 32.

- **Insect Photos . . .** Winning photos in the Insect Photo Salon held at recent meeting of Pacific ESA. Pg. 38.

- **Fertilizer Phosphates . . .** Phosphatic fertilizers preferred for use in cultivated and humid soils, which are the conditions facilitating their diffusion. Pg. 45.

- **F-P Mixtures . . .** Fertilizer-pesticide mixtures not recommended for use in New Jersey agriculture. The diversity of crops makes them impractical for general recommendation in this area, says Dr. Bailey Pepper. Pg. 51.

- **Oxide or Elemental Basis? . . .** Proposal to switch fertilizer nutrient labeling from oxide to elemental basis has its critics as well as its proponents. The suggested new Uniform Fertilizer Bill discussed as fertilizer control officials meet in Washington. A full report on pg. 48.

UNIFORM INSECTICIDES

Produced by Raymond clean, dustless, automatic, pulverizing units including Blended Field Strength Products also High and Low Concentrate Formulations

HELICOPTER METHOD OF LOW LEVEL DUSTING WITH "DDT" FOR CROP INSECT CONTROL

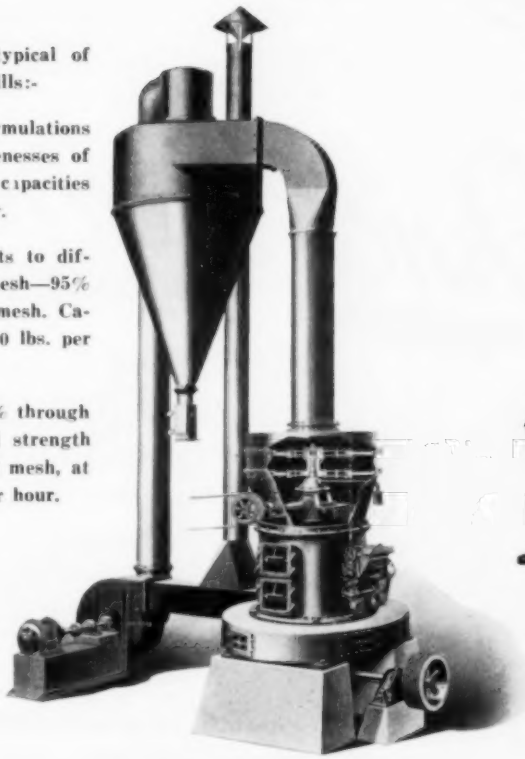
Such operations as these are typical of Raymond ***whizzer-type*** Roller Mills:-

Grinding various insecticide formulations of BHC, Toxaphene, etc., to finenesses of 98% to 99% passing 325 mesh at capacities of 1000 to 1500 pounds per hour.

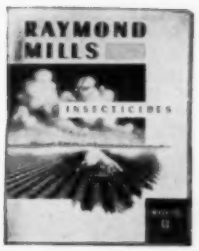
Pulverizing rotenone-bearing roots to different grades: 95% minus 200 mesh—95% minus 100 mesh—80% minus 100 mesh. Capacities ranging from 600 to 1750 lbs. per hour.

Production of dusting sulphur 98% through 325 mesh — also handling field strength mixes at 90% to 95% minus 325 mesh, at capacities of 2500 to 3000 lbs. per hour.

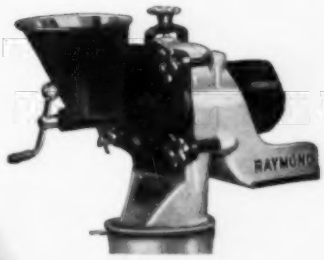
If you have a similar problem, tell us your requirements — our experience on many different types of installations is available to you in selecting Raymond equipment for your job.



Raymond Whizzer-Type Roller Mill for general purpose insecticide grinding.



Write for Raymond Bulletin No. 68



Raymond Laboratory Screen Mill for running tests on small batches of materials.

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Raymond Division

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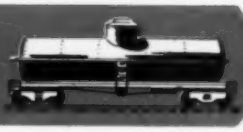
Raymond
MULTIWALLS

5 PHILLIPS Fertilizer Materials for High Analysis Mixtures

1 Ammonium Sulfate

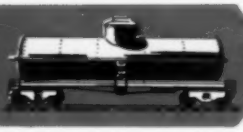
New Premium Quality Phillips *66* Ammonium Sulfate contains 21% nitrogen, 23.8% sulfur. It is *dry*-cured to remove excess moisture, prevent caking. Uniform dust-free crystals flow freely, mix easily. Ideal for all analyses of mixed goods and for direct application. Available in bags or bulk.

2 Anhydrous Ammonia



Phillips *66* Agricultural Ammonia contains 82% nitrogen. It's a convenient, economical source of nitrogen for mixed goods formulation. Tank car shipments are assured to Phillips contract customers by Phillips huge production facilities in the Texas Panhandle and at Houston, Texas.

3 Nitrogen Solutions

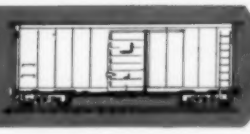


Get more N per dollar! There are three Phillips *66* Nitrogen Solutions for use in preparation of high-analysis fertilizers and the ammoniation of superphosphate. These solutions keep manufacturing costs low; help rapid, thorough curing.

4 Ammonium Nitrate

Phillips *66* Prilled Ammonium Nitrate contains 33.5% nitrogen. The small, coated prills resist caking, handle easily. Depend on Phillips *66* Prilled Ammonium Nitrate for free-flowing uniform properties and top-notch crop response as a direct application material. It's an ideal companion high nitrogen fertilizer for quality mixed goods.

5 Triple Superphosphate



Phillips *66* Triple Superphosphate contains 46% available phosphoric acid. Ideal for use in formulation of high-analysis fertilizers.

PHILLIPS CHEMICAL COMPANY

A Subsidiary of Phillips Petroleum Company, Bartlesville, Oklahoma

Phillips 66

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DES MOINES, IOWA—*606 Hubbell Bldg.*
HOUSTON, TEX.—*1020 E. Holcombe Blvd.*
INDIANAPOLIS, IND.—*1112 N. Pennsylvania St.*
KANSAS CITY, MO.—*500 West 39th St.*
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NEW YORK, N.Y.—*80 Broadway*
OMAHA, NEB.—*WOW Building*
PASADENA, CALIF.—*330 Security Bldg.*
RALEIGH, N. C.—*804 St. Mary's St.*
SALT LAKE CITY, UTAH—*68 South Main St.*
SPOKANE, WASH.—*521 E. Sprague*
ST. LOUIS, MO.—*4251 Lindell Blvd.*
TAMPA, FLA.—*3737 Neptune St.*
TULSA, OKLA.—*1708 Utica Square*
WICHITA, KAN.—*501 KFH Building*

SYSTOX*

Registration Status

Introduced in 1951, SYSTOX has given consistent and outstandingly effective control of mites, aphids and leafhoppers on a wide variety of crops. The first systemic insecticide ever approved for use on a food crop, SYSTOX registrations now include:

Cotton
Oranges
Grapefruit
Lemons
Seed Alfalfa
Beans
Brussels Sprouts
Broccoli
Cauliflower
Potatoes
Lettuce
Cabbage
Apples
Pears
Grapes
Strawberries
Muskmelons
Pineapple
Walnuts
Pecans
Almonds
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To make your insecticides "badder" for bugs and better for you...

use ESPESOL solvents

Yes, your insecticides will make a lasting impression on bugs if you use Espesol Solvents in your formulations. Because these solvents are unexcelled in quality and rigidly controlled for uniformity . . . so much so, that you can assure your customers—and the ultimate consumer—a vastly superior insecticide. Espesol Solvents have extremely high solvency power, readily solutionizing active toxicants. Use them as diluents for Benzenehexachloride, 2) Lindane, 3) DDT, 4) Toxaphene, 5) Dieldrin, 6) Aldrin, 7) Malathion. The coupon below brings you our complete catalog. Mail it today.

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Please send me your catalog and specifications on solvents for insecticides.

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Firm_____

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Now! FROM STANDARD OIL

Anhydrous Ammonia — Aqua Ammonia — Nitrogen Solutions

Right now you can contract with Standard Oil Company (Indiana) for Anhydrous Ammonia, Aqua Ammonia and Nitrogen Solutions. Here are six good reasons why you should.

1 **Experienced producer** of petroleum products for 66 years, Standard Oil now turns this production know-how and research experience to the manufacture of Anhydrous Ammonia, Aqua Ammonia and Nitrogen Solutions. You can be sure of Standard Oil as a dependable source of supply. New, modern chemical laboratories assure you of exacting quality control.

2 **Convenient manufacturing plant location** at Hammond, Indiana in the heart of Mid-America is an ideal shipping point. Plant is adjacent to the nation's largest rail and truck center, permitting the greatest possible flexibility of shipment routing for speed and for *your* convenience.

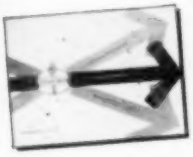
3 **Storage facilities.** Extensive storage for Anhydrous Ammonia, Aqua Ammonia and Nitrogen Solutions are a part of the facilities of the plant. You are thus assured of immediate availability and the immediate filling and shipping of *your* order.

4 **Shipping facilities.** Fleets of tank cars and tank trucks are ready to deliver Anhydrous Ammonia, Aqua Ammonia and Nitrogen Solutions to you. Plant-side trackage permits positioning cars for immediate filling and shipment of *your* order.

5 **Simplified ordering.** As a Midwest manufacturer, chances are you are already a Standard Oil customer for fuels and lubricants. You may thus have an established purchasing continuity with Standard. You may order Anhydrous Ammonia, Aqua Ammonia and Nitrogen Solutions just as easily as you order your petroleum products—and in the same way. Call your nearby Standard Oil office. Teletype facilities or direct phone line will be used to start *your* order moving.

6 **Designed to fit every need.** Standard offers four Nitrogen Solutions, both Commercial and Refrigeration grade Anhydrous Ammonia and Aqua Ammonia. Nitrogen Solutions are:

Nitrogen Solution 410A	(41.0% total nitrogen)
Nitrogen Solution 410B	(41.0% total nitrogen)
Nitrogen Solution 370	(37.0% total nitrogen)
Nitrogen Solution 490	(49.0% total nitrogen)



Find out more about the advantages of ordering Standard Anhydrous Ammonia, Aqua Ammonia and Nitrogen Solutions. Get a copy of this new booklet describing the full line of nitrogen products. In the Midwest, call your nearby Standard Oil office. Or write, Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY
(Indiana)

STANDARD

Arcadian® News

Volume 1 — For Manufacturers of Mixed Fertilizers — Number 1

SIX NEW NITROGEN SOLUTIONS improve fertilizer quality and cut freight and drying costs

Water squeezed out of new solutions to cut shipping costs as much as 15%

SIMPLIFY PRODUCTION OF MODERN GRANULAR OR SEMI-GRANULAR GOODS

Production of the popular, dustless, non-caking granular-type mixed fertilizers is easier and more economical with new, more concentrated NITRANA® and URANA® Nitrogen Solutions. These six new Nitrogen Division Solutions make a total of 16 Solutions available from Nitrogen Division plants to give fertilizer manufacturers greater flexibility in operation than ever before.

Since the new solutions contain less water, your saving on freight alone can run as high as fifteen per cent. Less water has to be removed from the fertilizer after mixing. Our technical service representatives are always available to assist you in the selection, handling and formulation of the most suitable Nitrogen Solution for your particular fertilizer production—your call will be given prompt attention.

New NITRANA 2M, 3M, 3MC and 7 Solutions, like NITRANA 2, 3, 4 and 6, are composed of ammonium nitrate dissolved in ammonia and water. The characteristics of these solutions are shown in the table at right.

New URANA 11 and 13 Solutions, like URANA 10, 11 and 15, are composed of both urea and ammonium nitrate in ammonia and water. (See table.) Since they provide water-soluble organic nitrogen as well as ammonia and nitrate nitrogen, they are excellent for producing semi-granular and organic nitrogen fertilizer grades.

These solutions provide easier, more economical handling, excellent ammoniation, good particle agglomeration, and quick curing with less caking.

Prompt service on the new solutions is being made available from Nitrogen Division plants at Hopewell, Va., Ironton, Ohio, and Omaha, Neb. In-transit service helps assure speedy arrival of shipments in many additional areas. For full details, consult your Nitrogen Division technical service representative.

Concentrated new solutions assure greater flexibility in producing granular and semi-granular fertilizers.

	New NITRANA Solutions				New URANA Solutions	
PER CENT BY WEIGHT	**2M**	**3M**	**3MC**	**7**	**11**	**13**
Free ammonia	23.8	28.0	29.7	26.0	19.0	33.0
Ammonium nitrate	69.8	60.0	64.5	68.0	58.0	45.1
Urea	—	—	—	—	11.0	13.0
Water	6.4	12.0	5.8	6.0	12.0	8.9
NITROGEN BY WEIGHT						
Free Ammonia N	19.57	23.02	24.43	21.37	15.62	27.15
Ammonia N, combined	12.22	10.50	11.28	11.90	10.15	7.89
Nitrate N	12.22	10.50	11.29	11.90	10.15	7.89
Urea N	—	—	—	—	5.12	6.07
Total N	44.01	44.02	47.0	45.17	41.04	49.0
Specific Gravity at 60°F/60°F	1.147	1.083	1.089	1.125	1.162	1.033
Lbs. per gal. at 60°F	9.56	9.03	9.08	9.38	9.69	8.61
Lbs. N per gal.	4.21	3.98	4.27	4.24	3.98	4.22
Vapor pressure psig at 104°F	18	25	34	24	10	51
Salting out Temperature, °F	26	–36	–30	–6	7	–17

Test Forest Fertilization as a Promising Big New Market

NEED CAREFUL YIELD AND COST DATA TO DETERMINE PROFITS FROM TREE-FEEDING

One airplane, with simple equipment, can fertilize hundreds of acres of forest per day. Trees, like other crops, need plant foods to make vigorous, healthy growth. To build this promising new market for fertilizers, we have to find out how well it pays to feed forest trees.

Recent tests of fertilizing trees have indicated increases in growth ranging from 40 to 65 per cent. Current, larger-scale work is directed toward improving techniques of fertilization. Crop dusting planes have been used where landing space is available. In rugged mountain terrain, helicopters have proved more effective.

New in the United States

Fertilizing of trees to get a greater volume of wood quicker is new in the United States, although it has been done for some time in parts of Europe where wood has been in short supply for centuries. Potash and nitrogen have proved especially important for many forest soils. Fertilizer produces more wood per acre and knocks several years off the time required to grow saleable wood for timber or pulp. Fertilizer also has certain advantages for Christmas tree production.

Most of the reports on plant food for trees pay little attention to the dollar and cent benefits. Recent tests are aimed to determine the practical values of forest fertilization. In one such test, Rutgers University Forestry Department, in cooperation with Nitrogen Division, is checking the value of 400 pounds of 12-12-12 per acre on a red pine plantation at Beemerville, New Jersey.

Provides Many Benefits

Besides providing a new market for the fertilizer industry, forest feeding gives crop dusters the prospect of a new, less hazardous custom application program. Airplane fertilization of forests, inaccessible to ground equipment, can greatly improve ground cover and increase wild life. This should interest hunters and conservationists. Farmers, pulp and paper firms and other woodland owners stand to gain the greatest benefits. For the latest information on forest fertilizer developments, write to Nitrogen Division, Allied Chemical & Dye Corporation, 40 Rector St., New York 6, N. Y.

Farm Editor Points Out Fertilizer is Better Buy Than High-Priced Land

Farmers are in danger of paying too much for land, says Paul C. Johnson, Editor of Prairie Farmer magazine. High-priced land, subject to high taxation, can let farmers down badly, because land is less important in the farm production picture than it has ever been.

Farmers don't pay taxes on fertilizer. And from your customers' own experience, you know fertilizers can often improve crop yields on average land to equal yields on the most expensive land available.

Winter Cell Division Explains Why Grain Needs Fertilizer Now

Down inside the overwintering wheat plants, cell division speeds up as spring approaches. The cells which initiate wheat heads and determine maximum yields are often formed before spring top-dressing of nitrogen can be applied. Winter or fall application of nitrogen, or use of a high-nitrogen 1-1-1 fertilizer, makes sure the grain has enough nitrogen at this critical stage. Even if the soil is too wet or too soft for winter or early spring top-dressing, the crop has all the plant food it needs.

Nitrogen also improves stooling out, makes longer grain heads and bigger kernels, and increases the protein content of the grain. It helps make the leaves bigger and greener to provide the food to make heavier, bigger grain crops. Your customers can profit by using fertilizer on wheat before spring.

NITROGEN DIVISION CONTINUES CAMPAIGN TELLING MILLIONS OF FARMERS FERTILIZER GROWS PROFITS

The powerful, full-page, two-color advertisements shown above are part of a continuing series appearing in leading farm magazines. This campaign, spelling out the profits to be made in farming with more fertilizer, is conducted by Nitrogen Division as a service to the entire fertilizer industry.

Each of these messages describing the benefits of wise use of fertilizer reaches 3½ million readers of farm magazines. Each advertisement tells how fertilizer helps your customers grow bigger yields of crops at lower cost, to assure a bigger return from land, labor, machinery and management. Because the price of fertilizer has not gone up like the prices of most other things farmers must purchase to grow crops, these ads say fertilizer is the farmer's best buy today.

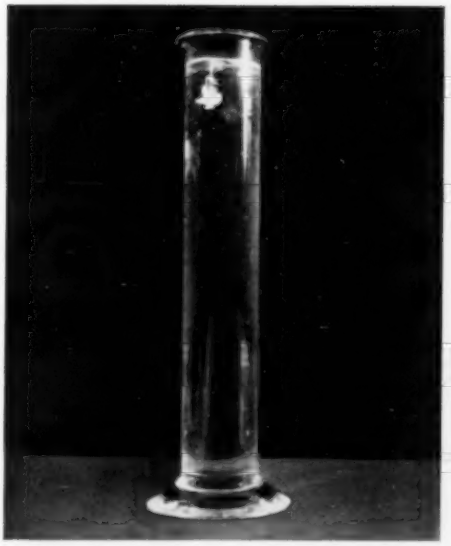
This series, instituted a year ago, is continuing through the winter season and on into the 1957 farm fertilizer buying year. It stresses ordering enough fertilizer, ordering early and accepting early delivery. In every one of these advertisements, farmers are urged to "see your fertilizer dealer." This campaign is designed to help you in your service to farmers. To make it work better, send your comments and suggestions to Nitrogen Division.

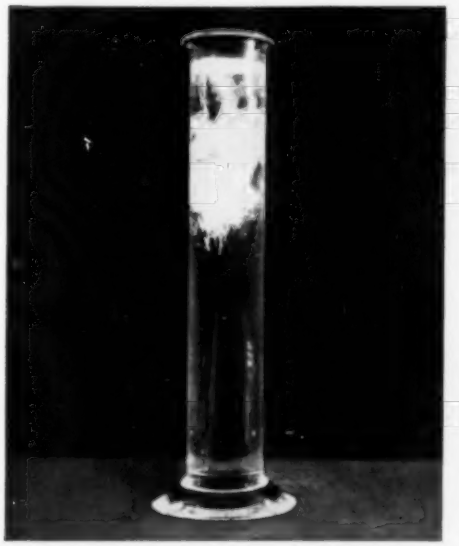
Agronomists Favor Manufacture of Fewer Grades of Mixed Fertilizer

About 15 fertilizer ratios, plus straight materials, are all we need for the entire country, according to Lewis B. Nelson of the U.S.D.A. Agricultural Research Service at Beltsville. By limiting analysis to no less than about 24 plant food units per ton, we might average about 3 grades per ratio, or a total of 45 grades.

Such simplification would be a big benefit to both manufacturers and farmers, and still give them plenty of leeway for good crop feeding.

In Minnesota, for example, soil tests show that 90 per cent of the fertilizer recommendations can be made with 8 or 10 ratios. In New York, about 90 per cent of the mixed fertilizer sold is made of 5 ratios now recommended. In Kansas, 5 ratios will cover most farming needs. Even in the complex of California soils and crops, straight materials, plus 5 basic ratios can satisfy most needs.





THIS TIME-DISPERSION TEST shows convincingly how TRITON X-151 and TRITON X-171 impart excellent spontaneity in water. In the first photo, a few milliliters of a Toxaphene concentrate containing these emulsifiers are added to a water-filled graduate. 30 seconds later emulsification is practically complete—*even without agitation.*

From drop to emulsion in 30 seconds with TRITON emulsifiers

When pesticides are formulated with TRITON X-151 and TRITON X-171, they disperse quickly in water even without agitation. This means that with one or both of these emulsifiers you can now improve the salability of practically any emulsifiable concentrate.

Unlike ordinary emulsifiers, TRITON X-151 and TRITON X-171 impart improved spontaneity *along with* excellent stability in the resulting emulsion. Because they're ether-type emulsifiers, they also enable the concentrates themselves to better resist breakdown during long storage.

An ever-important advantage of TRITON X-151 and TRITON X-171 is that they're the only two emulsifiers you need for a wide variety of toxicant-solvent systems and water hardness conditions. This simplifies processing and storage, and eliminates waste if solvents or pesticides are later changed. Write today for samples and complete data.

Chemicals for Industry

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

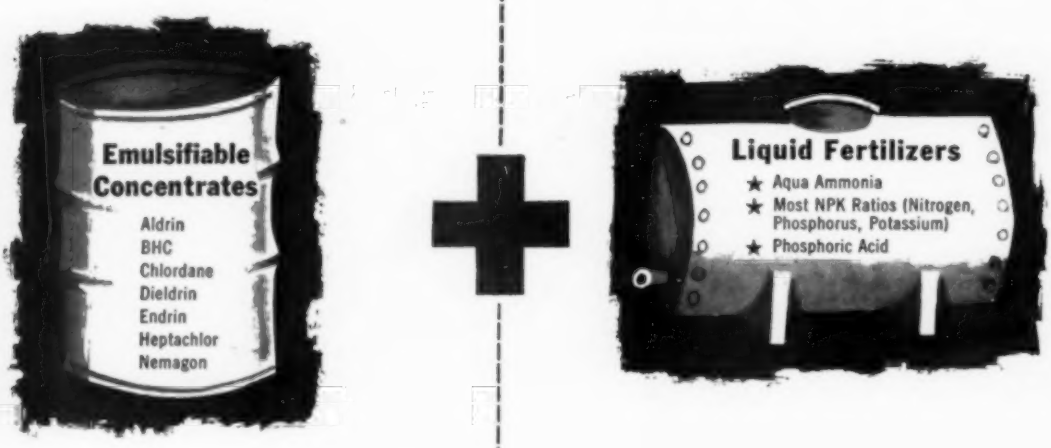
Representatives in principal foreign countries

TRITON *is a trade-mark, Reg. U. S. Pat. Off. and in principal foreign countries.*

with practically no limitations

NOW! You Can Field Mix

Liquid Fertilizers and Pesticides



with the Versatile EMCOLS H-A H-B *Emulsifiers*

Further advantages of this novel system:

1. Emulsifiable pesticide concentrates are compatible in liquid fertilizers regardless of sources of NPK (Nitrogen, Phosphorus, Potassium).
2. Emulsions are easily formed with minimum agitation.
3. Maximum flexibility is provided for controlling pesticide-fertilizer dosages in mixed crop requirements.
4. Pesticide concentrates are also suitable for conventional aqueous spray applications in case of carry-over stock.

All these advantages make this novel system economically attractive to formulators, applicators and growers.

For further technical information, contact your local Emulsol representative, or write direct to

EMULSOL CHEMICAL CORPORATION
division of the Witco Chemical Company
59 EAST MADISON STREET • CHICAGO 3, ILLINOIS, U.S.A.

Photo courtesy Tryco Mfg. Co., Inc.

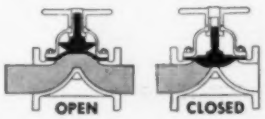
Handwheel valve, rising stem, screwed ends, ¼" to 3".

One-quarter turn, quick-acting valve, ½" to 2".

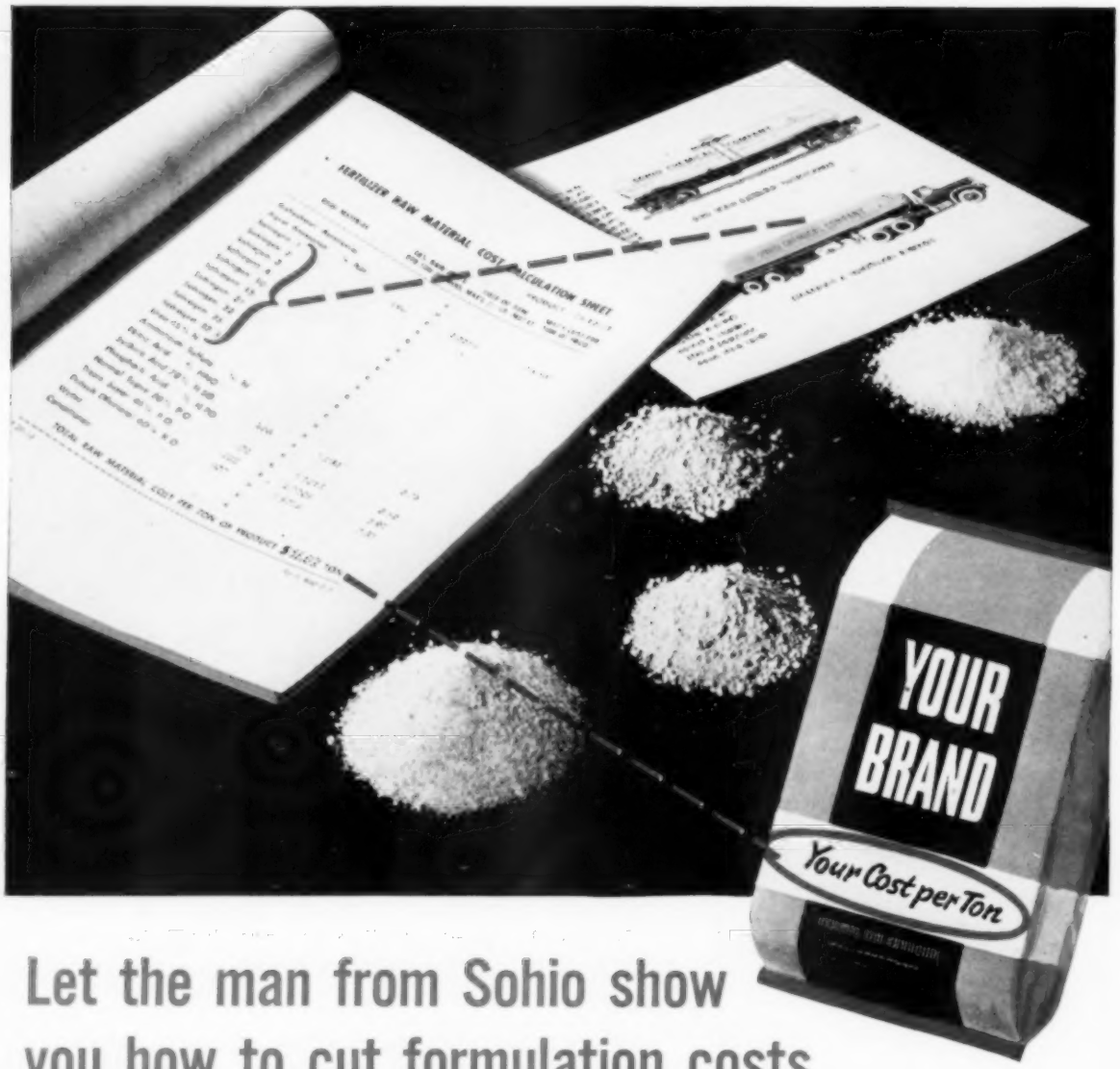
Specify GRINNELL-SAUNDERS DIAPHRAGM VALVES

For trouble-free operation, long life — be sure the nitrogen solutions piping you buy is equipped with Grinnell-Saunders Diaphragm Valves — the proved-in-performance valve for handling corrosive chemicals. Valve design absolutely isolates the operating mechanism from the fluid in the line. Resilient diaphragm assures leakproof closure, even if grit or scale are in the line. Maintenance is simple. Diaphragm may be replaced without removing valve from the line. No refacing or reseating is necessary.

Bodies of cast iron (plain or rubber-lined), aluminum, stainless steel; diaphragms of rubber, neoprene, or other synthetics. Grinnell Company, Inc., Providence, R. I. Branches in principal cities.



GRINNELL-SAUNDERS DIAPHRAGM VALVES



Let the man from Sohio show you how to cut formulation costs

THERE's many a way to skin a cat — solve your formulation problems — *and cut costs* — when you have Sohiogen solutions to back you up.

In many cases, a simple change in materials . . . rate of ammoniation . . . or chemical and physical characteristics can make differences in formulation results and cost of manufacture.

The complete line of Sohiogen nitrogen solutions offers greater flexibility of formulation. No other nitrogen producer offers a more complete line.

What's more, the man from Sohio is trained to help you in your selection. He knows formulation problems. And, he's prepared to work out advantages of shipping and handling . . . or show you ways to use Sohiogen's increased flexibility to greatest cost-cutting advantage.

So call the man from Sohio. He'll be glad to help. And you'll be glad he did.

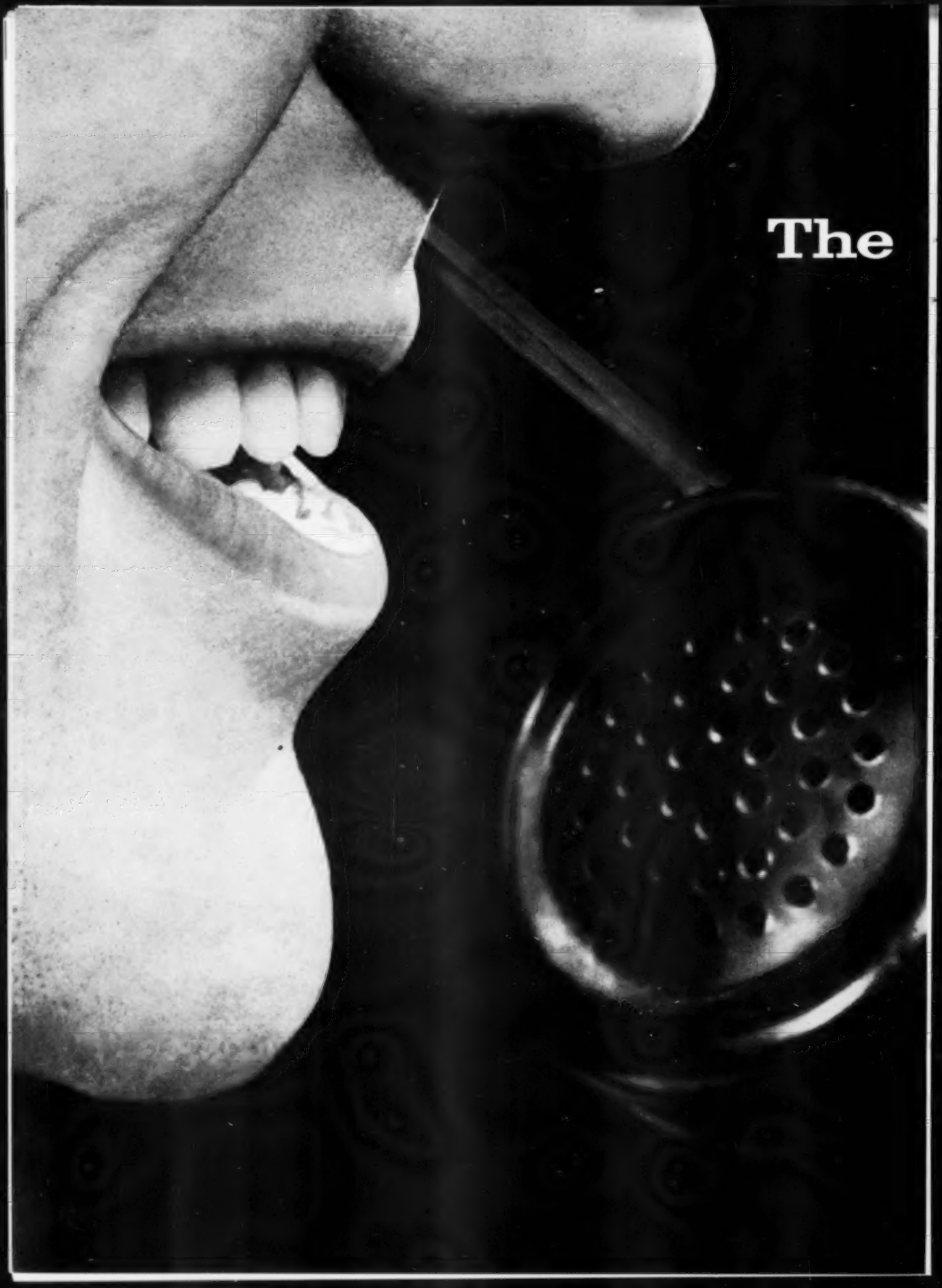
We're serious about service at Sohio

SOHIO

SOHIO CHEMICAL COMPANY

P. O. BOX 628

FT. AMANDA RD. • LIMA, OHIO


The

Man from St. Regis says:

"Get 95% of Weights Accurate within 5 ounces"

Specially designed for packaging fertilizer, the St. Regis 135-AS Model F Bagging Scale gives high production rates, accurate weighing, and easier operation.

Exclusive design features of the St. Regis Fertilizer Scale include stainless steel surfaces on flow chute, flow gate scale bucket and scale-bucket gate to prevent corrosion and fertilizer build-up; and electro-pneumatic controls of standard makes.

Here are some of the ways that the St. Regis Bagging Scale gives you faster, more accurate packaging performance . . .

ACCURACY . . . You get an 18 to 20 bags-per-minute rate with all weights within eight ounces of accuracy . . . 95% of bags within plus or minus 5 ounces of desired weight.

INCREASED PRODUCTION . . . Single-bucket design handles 50-, 80-, and 100-pound bags . . . allows quick cleanout, minimum downtime for grade changes . . . weighs up to 20 bags per minute!

SAVINGS . . . The St. Regis Automatic Bagging Scale prevents wasteful overfilling . . . exclusive design features lower maintenance costs.

Southern Cotton Oil Company's Pensacola plant averages up to 15 100-pound bags per minute on this line equipped with a St. Regis 135-AS Model F Automatic Bagging Scale. Says J. T. Murphy, Manager . . . "not only is our packing rate higher, but output remains high when we are making as many as 30 grade changes a day."

St. Regis
PAPER COMPANY

Behind the Man from St. Regis stand experts in every field of packaging, ready to serve you.

Multiwall Packaging Division
St. Regis Paper Company, Dept. AC-1156
150 East 42nd Street
New York 17, N. Y.

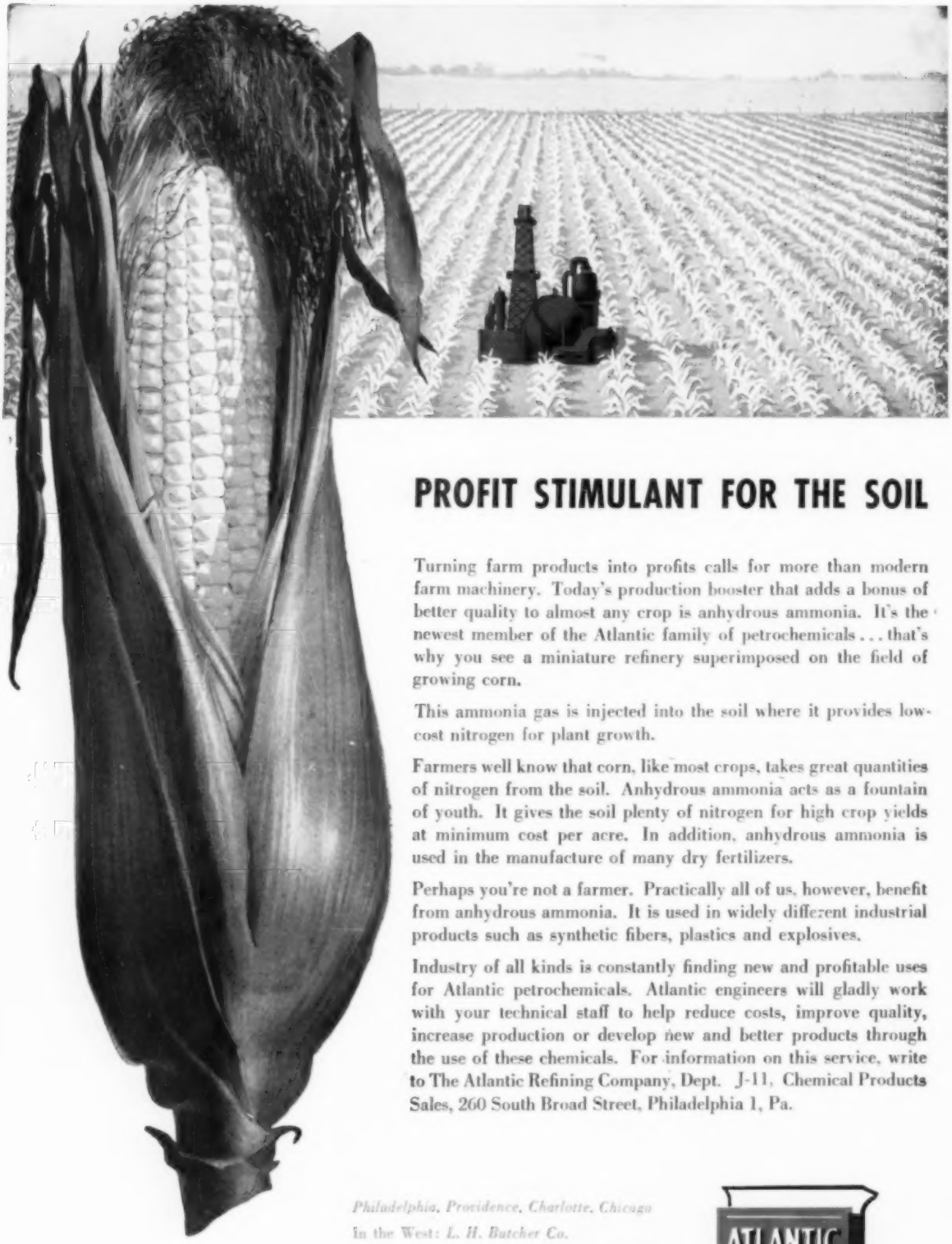
Please send me free illustrated booklet on the St. Regis 135-AS Model F Automatic Bagging Scale.

Name _____ **Title** _____

Firm _____

Address _____

City _____ **State** _____



PROFIT STIMULANT FOR THE SOIL

Turning farm products into profits calls for more than modern farm machinery. Today's production booster that adds a bonus of better quality to almost any crop is anhydrous ammonia. It's the newest member of the Atlantic family of petrochemicals . . . that's why you see a miniature refinery superimposed on the field of growing corn.

This ammonia gas is injected into the soil where it provides low-cost nitrogen for plant growth.

Farmers well know that corn, like most crops, takes great quantities of nitrogen from the soil. Anhydrous ammonia acts as a fountain of youth. It gives the soil plenty of nitrogen for high crop yields at minimum cost per acre. In addition, anhydrous ammonia is used in the manufacture of many dry fertilizers.

Perhaps you're not a farmer. Practically all of us, however, benefit from anhydrous ammonia. It is used in widely different industrial products such as synthetic fibers, plastics and explosives.

Industry of all kinds is constantly finding new and profitable uses for Atlantic petrochemicals. Atlantic engineers will gladly work with your technical staff to help reduce costs, improve quality, increase production or develop new and better products through the use of these chemicals. For information on this service, write to The Atlantic Refining Company, Dept. J-11, Chemical Products Sales, 260 South Broad Street, Philadelphia 1, Pa.

Philadelphia, Providence, Charlotte, Chicago

In the West: *L. H. Butcher Co.*

In Canada: *Naugatuck Chemicals Division of Dominion Rubber Company, Ltd.*

In Europe: *Atlantic Chemicals SAB, Antwerp, Belgium*

ATLANTIC
PETROLEUM
CHEMICALS

Here is a lightweight, portable, automatic performer that will handle any product that establishes an angle of repose. Typical examples: rice, sugar, corn, cracker meal, poultry feeds, granite grits, salt and dry chemicals.

Bemis Packer-Ette will reduce your costs through accuracy, speed and efficiency. It is just the packer for you in any operation that does not justify a heavy-duty, permanent installation.

Packer-Ette gives you so many benefits and features that it is impossible to do more than hit the high spots here. You'll want to get all the facts. Ask your Bemis Man . . . or write us for folder and details.

JUST LOOK . . .

SPEED—Up to eight 100-lb. bags per minute, depending on flow characteristics of your product.

ACCURACY—Plus or minus 2½ ounces or better on 100-lb. bags, depending on product characteristics. Self-aligning and self-cleaning knife edges of the scale assure consistent, accurate weights.

OPERATING EASE—The operator places an empty bag on the filling tube and starts the cycle by depressing the foot switch . . . that's all. The bag holder opens automatically when the filling cycle is complete. All controls are at eye level.

BEMIS VICON® FEEDER—A unique means of moving products from supply hopper to scale beam; a two-stage pulsating feeder tray first feeds rapidly, then at a rate which can be controlled for accuracy. When the exact weight is reached, the feeder cuts off and the filled bag is deposited automatically on the sewing machine conveyor.

CAPACITIES—From 25 lbs. to 150 lbs. Easily adjustable for varying bag sizes.

TAKES LIMITED SPACE—Width, 26"; depth, 42"; maximum over-all height, 97⅝"; minimum, 76".

LIGHT AND PORTABLE—Shipping weight, 600 lbs. Portable mounting for use in various locations.

NO INSTALLATION SERVICE—Just move it in and plug into a 110-volt, 60-cycle line. All electrical equipment enclosed in cast-iron explosion-proof boxes.

At last . . . big packer performance at little packer price . . .

The New Bemis Packer-Ette!

Bemis

General Offices—St. Louis 2, Mo.
Sales Offices in Principal Cities

Pesticide Manufacturers

Igepon T-77

Igepon AP-78

improve your wettable powders with these Antara surfactants:

These Igepon® and Nekal® products are particularly recommended for formulating wettable powders because they ensure fast wetting-out and form stable dispersions. They can easily be dry blended with most herbicides, fungicides, and insecticides.

Nekal BA-75

Fast wetting out in hard or soft water

Nekal BX-78

NEW... Nekal WS-99 is the latest addition to our line of agricultural surfactants. It is a powerful new anionic wetting agent which dissolves in both water and hydrocarbons. Try Nekal WS-99 to increase the wetting speed of difficult formulations.

For specific information on the Antara surfactant that will do the best job for you, call or write our technical service department.

Nekal WS-99

ANTARA® CHEMICALS

ANTARA gaf

A SALES DIVISION OF

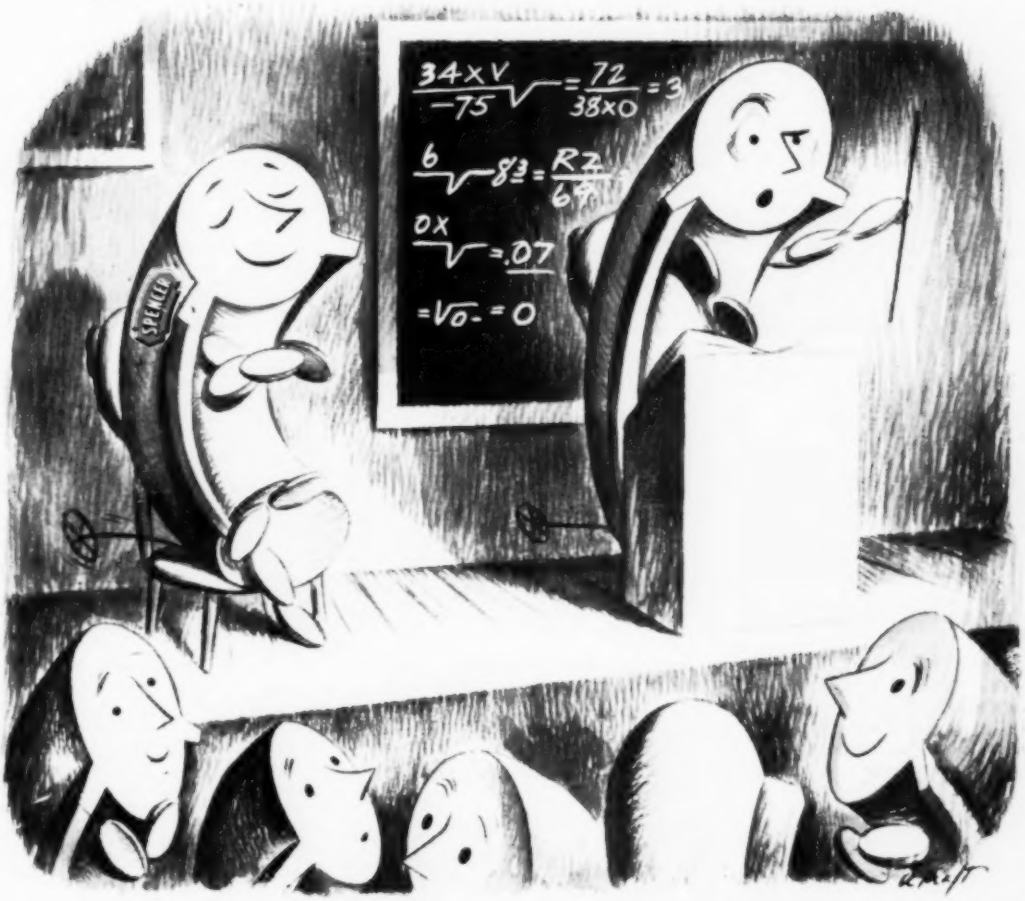
GENERAL ANILINE & FILM CORPORATION

435 HUDSON STREET • NEW YORK 14, NEW YORK

SALES OFFICES: New York • Boston • Providence • Philadelphia • Charlotte • Chattanooga • Chicago Portland, Ore. • San Francisco • Los Angeles. IN CANADA: Chemical Developments of Canada, Ltd., Montreal

Igepon and Nekal products manufactured by General Aniline & Film Corp. are sold outside the United States under the trademarks "Fenopon" and "Antara-Humifen," respectively

Spencer Service is Wonderful



"Gentlemen, according to my latest discovery ...nothing is faster than Spencer Service!"

Spencer agronomists are there! Spencer's team of experienced agronomists is constantly at work helping to educate your present & future customers in the value of proper fertilization.

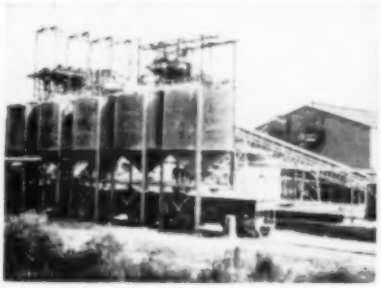
SPENCER

America's Growing Name In Chemicals

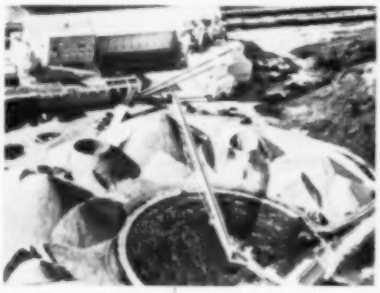
SPENCER CHEMICAL COMPANY, Dwight Bldg., Kansas City 5, Mo.
District Sales Offices: Atlanta, Ga.; Chicago, Ill.; Memphis, Tenn.; Kansas City, Mo.
Works: Pittsburg, Kans.; Chicago, Ill.; Henderson, Ky.; Vicksburg, Miss.; Orange, Tex.

Pictures tell the story of CYANAMID service in phosphate rock

1. The big scoop. Each bucketful brings up several tons. Four of these "walking giant" draglines start the production of phosphate.



2. Phosphate "laundry." After phosphate is mixed with water, it is sucked by huge centrifugal pumps to this washing plant. Phosphate particles are washed and screened, then stored in hopper bins for shipment to drying and grinding plant.



3. Many different grades of phosphate rock. At Brewster, phosphate is stacked according to grade in semicircle. Underground conveyor belt below piles allows close control of grade mixture moving into drying plant in background.

4. Every shipment is clean. Railroad cars (and boats) are carefully inspected and cleaned before filling with one of the twenty-eight separate grades required by both agriculture and industry. Phosphate for direct soil application is also bagged.

5. Check and double-check. For quality control, chemists with specialized experience carefully follow each step in phosphate rock production—from the location of new mine sites right up to the last sampling of each carload that leaves the plant.

6. Technical help in your own plant. As a Cyanamid customer, you have at your disposal the services of our staff of technical specialists, who will help you solve any problems that may arise in the manufacture or use of phosphate rock.

7. Awaiting your phone call, wire, letter. Your order is received and processed in this office by trained personnel *at the point of shipment* —Brewster, Florida. You get exactly what you order—with a maximum of efficiency, a minimum of delay.

AMERICAN Cyanamid COMPANY

AGRICULTURAL CHEMICALS DIVISION

30 Rockefeller Plaza, New York 20, N. Y.

Producers of:

AERO® Cyanamid, Fertilizers—Defoliants—Herbicides
AEROPRILLS® Ammonium Nitrate Fertilizer
AERO® Ammonium Sulphate
AMANOL® Nitrogen Solutions
ANHYDROUS AMMONIA
PHOSPHATES for Acidulation and Direct Application
THIOPHOS® Parathion Technical
MALATHION Technical
CYANOGAS® Calcium Cyanide Fumigants
HCN Fumigants
POTASSIUM CYANATE Weedkiller for Agriculture and Turf

Editorial
COMMENTS

SEVERAL years ago the practice of adding surfactants to fertilizers was tested out, the idea being to produce a non-caking, free-flowing product which would cure more rapidly and be easier to handle. Some fertilizer manufacturers who experimented with the practice reported that significant advantages resulted, and a considerable tonnage of surfactants continues to be used as a fertilizer additive. Not all investigators agreed, however, that the addition of surfactants was worth the cost, and the idea never gained the widespread acceptance that had at first been predicted for it.

Just recently interest has been directed to the subject once more, with the report from one investigator (See pg. 93) that use of surfactant-treated fertilizer resulted in substantial increases in yields in test plots. He also reported that crops grown on the soil so treated had improved flavor. Results of the tests, as a matter of fact, were so encouraging that the whole idea of employment of surfactants in agriculture will get another very close look. This could possibly be one of those happy, chance scientific discoveries, —so popular in the movies—where the research worker looking for a new type clam shell comes up with pearls instead.

PESTICIDE users have long complained that control of agricultural pests is an extremely complex subject, and that manufacturers make matters even more complicated by using dozens of different trade names for the same basic chemical product. To add further to the confusion, there are numerous conflicting recommendations as to what pesticide to use for each specific control problem, and just how and when to apply it. This factor was cited in a forum discussion by farmers at the recent meeting of the Canadian Agricultural Chemicals Association as one reason why they do not use more agricultural chemicals on their farms.

It would certainly make it a lot easier all around if there were a handful of dependable, all-purpose insecticides and fungicides, with which every grower was familiar, and which could be recommended for widespread use. The subject, fortunately or unfortunately as one looks at it, is just not that simple. Thirty years ago lead arsenate and Bordeaux mixture were standard, widely employed products, and farmers were thoroughly familiar with the way they acted and how they should be used. Today we have dozens of products which are eminently superior, but each has its own particular field of application, and specific knowledge is required as to how and when to employ each for optimum results.

For the future there would seem to be a very good prospect that pest control will grow more rather than less complex. Admittedly it may be too much to expect that the individual farmer can be an expert on modern day pesticides. But more can be done by the insecticide manufacturer, we feel sure, in educating the county agent, the dealer and the custom applicator. The farmer needs an expert to guide him, and one of these men is the logical choice for the job, in

(*Continued on Page* 113)

Tick egg mass. Northern Rhodesia

Controlling CATTLE TICKS and tick borne diseases in Central Africa

*By John G. Matthysse**
Cornell University
Ithaca, New York

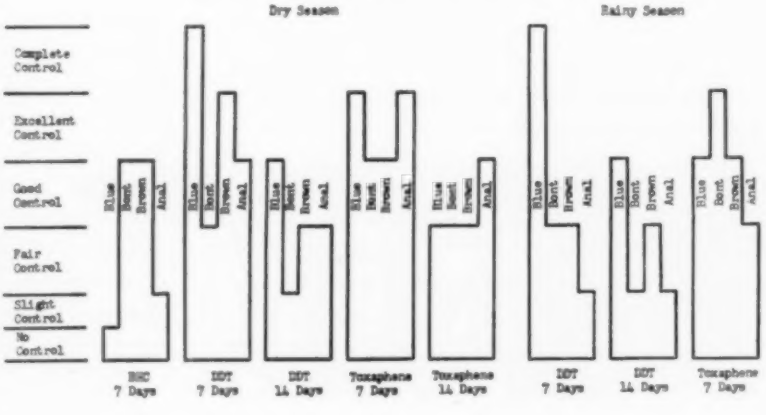
STOCKMEN in the United States are indeed fortunate to have a minimum of trouble from insect, tick and mite borne diseases. The large volume of insecticides used on livestock in the U.S. serves largely to protect stock from direct losses due to annoyance, blood-sucking, and myiasis. The situation is vastly different in the tropics, where insect and tick control plays a vital role in protection of livestock against diseases. In Africa, particularly, development of insecticidal control of direct insect and tick losses is in its infancy. Most cattle spraying and dipping is done to prevent tick-borne diseases. More publicity may be given to fly-borne trypanosomiasis (nagana of cattle), but it is probable that tick-borne diseases cause more monetary loss through lowered production and death. However, it should not be overlooked that trypanosomiasis causes a very large intangible economic and political loss by preventing stock raising in large areas in Africa.

Status of Control and Research

ALTHOUGH some cattle dipping and spraying is practiced in all countries in Africa, intensive operations are a rarity. Backward animal husbandry practices, tribal and nomadic conditions, and low stock value and income combine to prevent rapid progress toward tick-borne disease control. Countries in which the most progress has been made are also those in which extensive research has long been underway. The Union of South Africa stands foremost in control accomplishments as well as research. The excellent work of the Veterinary Department centered at Onderstepoort has greatly benefited all Africa. The Veterinary Department of Kenya, with research centered at Kabete, has also been most active. Recently, the British East Africa High Commission completed large and well-equipped laboratory facilities at Muguga in Kenya. Kenya, Tanganyika, and Uganda are here represented in the East African Veterinary Research Organization. Excellent contributions, particularly to basic research on the disease complex and tick bionomics, have been made in Algeria by the Pasteur Institute. The Veterinary Department of Southern Rhodesia, Nyasaland, and Northern Rhodesia have all made significant contribution to research and to control operations. Despite Central African Federation, these countries have continued to maintain separate facilities at Blantyre, Salisbury and Mazabuka, respectively. Workers in other countries have added to the fund of knowledge of economic ticks, particularly in the Congo, Nigeria, and Mozambique.

*Through the auspices of the International Cooperation Administration, U. S. State Department, J. G. Matthysse cooperated in research on cattle ticks in Northern Rhodesia during 1952 and 1953. Staff of the Department of Veterinary Services, Northern Rhodesian Government, Mazabuka, responsible for the project included the Director J. H. N. Hobday, the then Chief Veterinary Research Officer J. W. Macauley (now Chief Veterinary Research Officer of the Kenya Veterinary Department), the present Chief Veterinary Research Officer G. D. Shaw, and N. H. K. Nielsen and E. A. Woodhams.

Table 1
Experiment-Demonstrations Northern Rhodesia 1952
Observations on Tick Control by Dipping ordinary Beef Herds



The Diseases and Their Vectors

THE most important tick-borne diseases of cattle in Africa are East Coast fever, heartwater, redwater, and anaplasmosis. East Coast fever, caused by *Theileria parva* is a highly fatal disease of cattle, but fortunately is restricted in distribution. It is very important in Kenya, Tanganyika, Central Africa, Mozambique, and the Union of South Africa. The closely related *Theileria mutans* is more extensively distributed but far less destructive. *Theileria dispar* is found in North Africa. Ticks of the genus *Rhipicephalus*, particularly the brown tick *R. appendiculatus* are the important vectors of East Coast fever. Heartwater, caused by *Rickettsia ruminantium* is also a highly fatal disease, and is important throughout East, Central and Southern Africa. Ticks of the genus *Amblyomma*, particularly *A. variegatum* and *A. hebraeum*, the bont ticks, are the important vectors. In Africa, fatalities among mature cattle from redwater and anaplasmosis (gall-sickness) are less frequent, simply because premunition through calfhood infection is so common. These two disease complexes are present throughout Africa and are costly to all cattlemen. The causative agents in Africa include *Babesia bigemina, B. bovis, Anaplasma marginale* and *A. centrale*. The important vectors are the very common and widespread blue tick *Boophilus decoloratus* and the brown tick *Rhipicephalus appendiculatus* as well as other *Rhipicephalus species*. To add further complication, spirochaetosis is spread by *B. decoloratus* and *R. evertsi*, and a streptothricosus known as Senkobo skin disease is suspected of being transmitted by *A. variegatum*. The severity and complexity of the situation is evident by comparison to the American tropics where only one tick species and one disease is of primary importance, and that a complex which we have been able to eradicate in the United States.

The Control Problem

IS eradication a possibility in Africa? Certainly not for the forseeable future, and not with presently known chemicals. Primitive conditions would throw great obstacles in the path of any program to regularly treat all cattle in most African countries. Even more important, the African vectors involved include several three host species (ticks that feed on three different individuals during their life-span) in contrast to the single one host species eradicated in the U.S. Texas fever campaign. Also, the African tick species can readily maintain themselves on wild hosts.

Excluding large scale eradication, the problem becomes one of minimizing losses, largely through insecticide application, immunization, and administration of therapeutic drugs. Localized disease eradication is fraught with danger, as heavy losses in mature stock are to be expected upon reintroduction of infected ticks. East Coast fever may be an exception, but some authorities in Africa consider, even in this case, that slaughter is the only successful eradication campaign method.

A practical approach to tick control in tropical Africa requires considering the problem in three categories. The largest and most difficult problem involves cattle owned by the indigenous Africans. Second in importance, are beef types owned by European settlers. Dairy cattle, largely European owned, are fewest in number, but by far the most frequently treated.

An understanding of the biologies and seasonal abundance of the various cattle tick species is basic to any reasonable control program. Central Africa is a land of difficult agriculture, because of a long completely dry season and a short rainy season. The rainy season has long been known as the time of abundant "tick life" and upsurge of diseases. However, more careful observations indicate that the seasonal difference is actually the greater rainy season abundance of the more obvious adult ticks. Research in Northern Rhodesia and in Nyasaland showed that one group of tick species passed through but one generation a year. *Rhipicephalus appendiculatus*, other *Rhipicephalus* species, and *Amblyomma variegatum* are the more important species in this group, occurring largely as adults and eggs in wet season, and nymphs in the dry season. Control operations against these species must be most vigorous in the wet season, as disease transmission is greatest by the adults. The second

Spray racing experimental cattle. Central Research Station, Mazabuka, Northern Rhodesia.

Power pen spraying experimental cattle. Central Research Station, Mazabuka, Northern Rhodesia.

group of tick species breeds continuously, including *Boophilus decoloratus, Hyalomma rufipes* and *H. transiens*, and *Rhipicephalus evertsi*. The most important member of this second group, the blue tick *B. decoloratus*, is abundant throughout the dry season in all stages, so that dry season control practices must be highly effective against this species.

The Insecticides in Use

THE main chemicals in use are benzene hexachloride, DDT, toxaphene, and arsenic. Arsenic is still used in dips because of low cost and ease of vat-side analysis. However, the hazard of arsenic toxicity, the rise of arsenic resistant blue ticks, and the relative inefficiency of arsenic, has resulted in replacement of arsenic by chlorinated hydrocarbons. African owned cattle in Central Africa are treated largely wih either arsenic or benzene hexachloride. Cost is the major determining factor. European cattle ranchers quickly changed to BHC when this insecticide became available. BHC was found superior to arsenic against all tick species. Blue tick benzene hexachloride resistance appeared first on European owned ranches, where more intensive treating had been done. These ranchers quickly turned to DDT when it was found that DDT was effective specifically against the blue tick. In many cases, mixtures of BHC and DDT are now used to give greatest effectiveness against all tick species. The highly important heartwater vector, the bont tick, is but poorly controlled by DDT alone. The problem is far from solved, as blue tick resistance to DDT has occurred already. Toxaphene has come into large scale use for dairy cattle and better European beef herds, but high cost in Africa has slowed development of toxaphene for African owned beef cattle. The stable toxaphene emulsions, in such widespread use in the Americas, are very effective but comparatively costly in Africa.

Methods of Application in Use

AFRICA is a land of cheap manpower and expensive machine power. The vast bulk of tick control work involves man-power to herd cattle through dipping vats or to operate hand spray pumps. Dipping has many disadvantages, including cost of installation, immobility, necessity for treking cattle long distances, erosion around the vat, high recharging cost resulting in prolonged use of old foul dip, difficulty of maintaining an effective concentration, and injuries during dipping. However, for many primitive situations in Africa all disadvantages are counterbalanced by simplicity and speed of operation. Good coverage occurs without need of well trained and conscientious operators, as would be required for spraying.

Hand spraying techniques have been adapted for large scale use in Africa for all kinds of cattle. Cooper and Nephews have developed man powered ram pumps as well as conventional hand sprayers, and also the necessary pen and chute designs to handle numbers of cattle. In the author's experience, all such hand spraying techniques were too slow and laborious for the large numbers of African owned beef cattle requiring frequent application in Central Africa. Hand spraying of dairy cattle is effective and practical.

Power spraying techniques have been highly developed, particularly in spray races. Spray races involve high gallonage, low pressure, multiple nozzle spraying of cattle, as they run unimpeded through a chute or "race." Either stationary engines or power take-offs are used, driving a large centrifugal pump. Capacities of 100 gallons per minute are usual. The race floor is sloped to a single collection point, and the spray emulsion filtered before returning to the sump hole. Satisfactory operation requires a permanent installation with proper fencing for rapid handling of cattle. Studies in Northern Rhodesia and in the Union of South Africa indicated that spray racing is the most economical as well as most rapid treatment method. However, mechanical ability is required on the part of a conscientious supervisor in attendance during operation. African owned beef cattle situations all too often cannot meet this requirement, and neither can some European ranches. In these cases, dipping appears preferable.

Another power spray method involves single gun spraying as cattle mill around in a pen. Considerable training and experience is required to obtain adequate coverage. Light portable units developing medium pressure and gallonage are required. In Northern Rhodesia, units delivering 8 to 10 gallons per minute, at a minimum of 100 lbs. per square inch pressure were found satisfactory for two hose operation. Orchard type spray guns fitted with a number 12 disc (3/16 inch) were used. This method was developed primarily for African owned cattle. The owners built pens with trunks of trees and dug holes for installation of spray tanks. In some primitive locations, holes lined with tarpaulins were used. One spray unit, with government trained personnel, would then service many pens. Rotary positive action pumps (such as the Hypro) have been found satisfactory. Only emulsions should be used.

Insecticides and Application Methods

DURING 1952 and 1953, experiments were conducted in Northern Rhodesia to determine the most practical and effective methods and materials for controlling ticks on European and African owned beef cattle, and European dairy cattle. Table 1 presents abbreviated data to illustrate the relative efficiency of benzene hexachloride, DDT, and toxaphene dips. Fifteen cooperating European farmer owned ordinary beef herds were utilized, each herd pastured as a normal separate group, representing one replication. Data are presented for vats maintained at .014 to .025% gamma BHC, .15 to .25% DDT, and .14 to .25% toxaphene.

The high degree of BHC resistance of the blue tick, *Boophilus decoloratus* was evident immediately. Even though dip concentration was subsequently raised to .06% gamma, control was completely inadequate. DDT rapidly reduced blue tick infestations to very low levels.

(*Continued on Page* 117)

Some Observations on *Essential TRACE ELEMENTS* in Agriculture

by Vincent Sauchelli

IT was a French scientist, Gabriel Bertrand, who first clearly perceived the indispensability of those nutritional elements present in tiny amounts in the soil and in plants and animal tissues which he named "oligo-elements," and which we translate freely as "trace elements." Since his time agricultural workers have added substantially to our knowledge of these essential elements. As agriculture becomes more intensive, as the carrying capacity of grasslands and the per-acre yields of croplands are pushed to higher levels, the trace-element position requires closer examination.

Many experiment station workers continue to believe that most soils in the eastern half of the United States are adequately provided, except perhaps with one or at most two of these elements. The fact is we really do not know, and the only method for finding out is by trial and error. The usual philosophy governing these workers reflects a rather narrow viewpoint in that it usually thinks only in terms of drastic and often fatal deficiency. In other words, the research project is geared to the study of only one element at a time and the plant or animal must show unmistakable symptoms or "hunger signs" before the deficiency is recognized. Let us face it. No one has as yet made a thorough, adequate study of the trace-element position in each of our soil types to be able to describe definitely the true situation. Deficiency levels are not easily established. Hunger signs directly attributable to specific deficiencies of a few separate elements such as boron, zinc, copper, are clearly discerned in certain crops and in the chemical symptoms in cattle and sheep. Their interpretation is not always indisputable.

When the symptoms are produced by a multiple deficiency of trace elements in the diet, the investigator is more or less stumped. We do not know what the actual physiological requirements of plant and animal are with respect to these elements. If this is true, how can any person be dogmatic regarding the adequacy or inadequacy of the trace-element position in the soil or in the applied fertilizer or feed? The outstanding authority in the field of animal nutrition* has this to say on the subject: although the daily "requirement" for calcium, phosphorus, manganese and common salt is fairly well established, available knowledge does not permit one to give in quantitative terms the necessary allowances of cobalt, copper, iodine, iron, zinc, magnesium, potassium and sulfur, and while admitting the insufficiency of our knowledge of the mineral nutrition of plants and animals, it is gratifying to know that agricultural practices with trace element nutrition, although as yet empirical, are producing good results.

Research and farmer experience in Europe, Australia, New Zealand and in our own country have demonstrated a remarkable crop and animal response to trace-elemented fertilizer treatments. The history of agriculture contains many instances when art anticipated science. The empiricism regarding current trace-element usage may well turn out to be in the right direction. In the coming years, the pressure of population will demand the maximal possible yield of every cultivatable acre and of animal products. In anticipation of such demand, research worker and producer will have to broaden their attitude of acting only on evidence of acute deficiencies. Deficiencies of minerals may be present to a sub-clinical degree, and we should learn to look for evidence of a nutritional status which is holding back the full development of the productive potential of the plant and animal.

The above thoughts developed from the reading of several interesting papers published abroad recently. A brief summary of trace elements information abstracted from them follows:

(*Continued on Page* 119)

*Standard Values in Nutrition and Metabolism, Page 380, W. B. Saunders Co.

developments in—

Granulation and Ammoniation

*by Elmer C. Perrine**

Nitrogen Division,
Allied Chemical & Dye Corporation

DISCUSSION of the development of many industries reaches far back into their history for some foundation of understanding. When arranging developments in order of importance, one realizes that often events which appeared as trifles in original concept may later have a profound influence on an industry.

Although the granulation of fertilizer covers nearly a generation, some of the main barriers to progress have been breached only recently and other serious obstacles remain. Granulation is very closely associated with ammoniation. Among other things, the successful continuous ammoniator has been a very important link in the long detour around the problems of converting from even good batch ammoniation to the subsequent stages of granulation which are best performed continuously. As long ago as 1938 a batch practice of granulation was greatly improved when the ammoniating medium was distributed evenly enough to about double the ammonia take-up, thereby imparting more heat to the mass at an early stage in the process. This early heat is accepted as a very important feature today.

The basic simplicity of many systems has probably limited development because passable results are obtained through the bare-handed skills of the better operators. The conspicuous contribution that manual skills have made to the industry has given rise to the statement that granulation is more an art than a science.

As we welcome the high promise of science and technology, we still recognize the great importance of the skilled operator who will long remain the best ally the technician has. A few days struggle with even the most instrumented equipment will demonstrate the value of skilled operating personnel. As in most good things that come to stay, science and technology are rapidly entering the industry.

The attaining of desirable physical condition in fertilizer was the original justification for granulating and this is still a very important reason. The trends in farming and the just demands of the consumer have increased the problems of fertilizer manufacturing. It is interesting to conjecture over the status of the industry if more effort had been expended to improve the machinery for fertilizer application. As fertilizer is further improved, the limitations of application equipment will be brought more into light, and some relief from the troubles over condition of fertilizer may be forthcoming from this angle. Beyond a certain perfection in a product, further improvements in the end results are often more economically achieved through improved means of using the product. Attempting to solve all of the problems of applying fertilizer by granulating it may prove to be quite costly.

Some practices that had their origin in local usages are being rather widely adopted in the industry. For instance, at present prices it is economically justifiable in some cases to add to 1,000 pounds of normal superphosphate as much as 30 pounds of ammonia, through nitrogen solutions, beyond the point of 100 percent retention, knowing that only some 20 of these additional 30 pounds will be retained by the (normal) superphosphate. This calculated loss is fairly predictable and is sometimes referred to as excess ammoniation. It is quite frequently practiced in rotary batch mixers. Some operators are actually doing this in rotary batch and in continuous ammoniators without recognizing it. Any gain in ammonia take-up beyond these figures in present equipment is made at the cost of so much lost ammonia that the use of acid is often resorted to. Thereafter the trend is toward excess acid rather than excess ammonia.

*Before Fertilizer Industry Round Table, Oct. 18, 1956, Washington, D. C.

The inadequacy of equipment and skills in some cases has resulted in the use of as much as 75 or 80 pounds more sulfuric acid than is indicated by the ammoniation requirements alone. Under these circumstances, and in equipment that is marginal at best, it now seems probable that much of the granulation was dependent on the use of large amounts of sulfuric acid.

We now observe that acid serves an important function in granulation beyond those of ammonia take-up and heat.

It can become costly, however, to resort to great amounts of any acid to perform functions that can also be performed by mechanical equipment, low cost fuel, or through control of the chemical and physical actions of the normal ingredients of the formulae.

Granulation and the drying are greatly simplified when the mass enters the dryer at 200 degrees F or higher, but such temperatures are difficult to reach in the ammoniation and more difficult to hold for any time with the moisture content at a desired level. This is a potent statement for it justifies large amounts of ammonia and acid, it questions any delay between mixer and dryer and endorses the new commercial practice of using steam or hot water as the source of added water. Enough steam would be required in many cases that the local or state laws or insurance regulations would demand that a licensed engineer be in attendance.

One very important development is the realization reflected in later design and operation that regardless of the processing ahead of the dryer, the volume of acceptable granulation through the dryer is substantially lower than when the task is that of merely removing the moisture. This fact has been painfully forced upon equipment manufacturers and operators alike. Of the many efforts to increase the effectiveness of the dryer in granulation, the most obvious one of raising the heat in the dryer is less rewarding than some others which become quite involved. Even though there may appear to be quite complete granulation before the material enters the dryer, the need for drying in such a manner as to retain this condition does place a load on the dryer above its mere moisture-removing capabilities.

Many systems, intentionally or from lack of any other provision, require that practically all forming of granules be effected in the dryer. Some systems further burden the dryer by requiring that it convert the wide pulsations of batch operation to continuous. This will reduce the effectiveness of the first 5 or 10 feet of the dryer's length. The extreme difficulty of delivering highly ammoniated batches of fertilizer through a sealed feed uniformly in a continuous flow to a dryer has added greatly to the popularity of continuous ammoniators. Much of the effectiveness of even these devices is too often lost through faulty delivery into the dryer, usually from large air leaks. In some cases for reasons of economy or lack of space, no combustion chamber is provided and some portion of the dryer is used to mix the cold air with the very intense heat of the burners. When all of these factors prevail in the same dryer, which may also be quite short, there is not much space or capacity left to influence granulation or to hold that which may have been started elsewhere.

Some dryers are now 60 or 70 feet long and regularly yield a quality product with several formulae at fair tonnage. Some co-current (parallel) flow dryers are so large that conservative tonnage is handled at such low temperature of product (120°F discharge) that no cooler is required and screens are present only as insurance against the system running amuck.

The indiscriminate recycling of fines as fast or as slow as they are made has caused untold misery, since any fluctuations throw the system into erratic performance. Even locally improvised arrangements for regulating the amount of fines that return to the process are very rewarding.

Quite a few systems employ two rotary dryers and two coolers with one continuous or batch ammoniator. Unless the dryers particularly are operated as individual units, serious consequences will quite probably result. After six months the operators of several of these systems did not know the screen size analysis nor the moisture content of the discharge material of each of the dryers, although good data had been collected on the composite product. As the product from one unit reached the conveyor belt, it was found to contain about twice the moisture of the product from the other dryer. The composite samples from the discharge end of the belt contained a fairly safe amount for the local conditions, but only if it had been uniform throughout the storage pile. Serious disintegration took place in the large pile.

At the cost of some tonnage there is a trend toward reducing the number of large particles in the finished product. Few plants now use a 3 mesh screen and some are tentatively going to 6 mesh, and 8 mesh is being considered in some cases as the largest size permissible. In the total screened sample some granulated fertilizer that contained only 1.5% moisture was found to have nearly 4% in the largest screened particles. This may contribute to bag setting, granule disintegration and to faulty performance through the farmers' equipment.

Most granulated fertilizers contain from 20 to 35% of their weight in the large particles that are subject to suspicion. The simple, direct approach of using less water to avoid forming the coarse particles usually results in excess fines, another source of trouble in making and in selling the product. The present practice of milling the oversizes is probably the most suitable, but the equipment for doing this will be quickly overloaded if its burden is greatly increased.

In one plant all ingredients were ground to quite a fine mesh ahead of mixing to control the final size of the particles. It is probably because several factors in addition to the size of the original ingredients have their influence on final particle size that this practice is not widely used.

High analysis goods are inviting serious consideration of phosphoric acid as far as it can serve a purpose. In the field not enough of this has been practiced to be conclusive re-

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INSECT PHOTO

By Charles Starker

First Place—Black and White
A mite "Trombicula deliensis" from New Guinea photographed through oil—immersion lens of monocular microscope 1014X—Cornelius B. Philip, Hamilton, Montana.

Second Place—Black and White
Female squash bee "Peponapis Pruinosa" collecting nectar from female squash flower—William P. Nye, Logan, Utah.

Front Cover

Top Photo: First Place—Color
Olive scale, "Parlatoria olea" (Colvee) mature female on upper surface of olive leaf, magnified 10.4 dia.—Frank E. Skinner, Albany, Calif.

Bottom: Second Place—Color
Olive Scale, "Parlatoria olea" (Colvee), mature female, waxy covering removed to reveal young larvae of Hymenopterous parasite ("Aphytis" sp.) feeding on body of scale. Magnified 12.4 dia.—Frank E. Skinner, Albany, Calif.

PRACTICALLY all entomologists at one time or another have become aware of the potential of photography as an added means of expression in their work, regardless of their particular sphere of interest. It was therefore quite appropriate for Dr. W. W. Middlekauff, program chairman at the recent Pacific ESA meeting to invite Dr. Arthur C. Smith, Bureau of Vector Control, State Department of Health, Berkeley, Calif. to set up an evening program on photography.

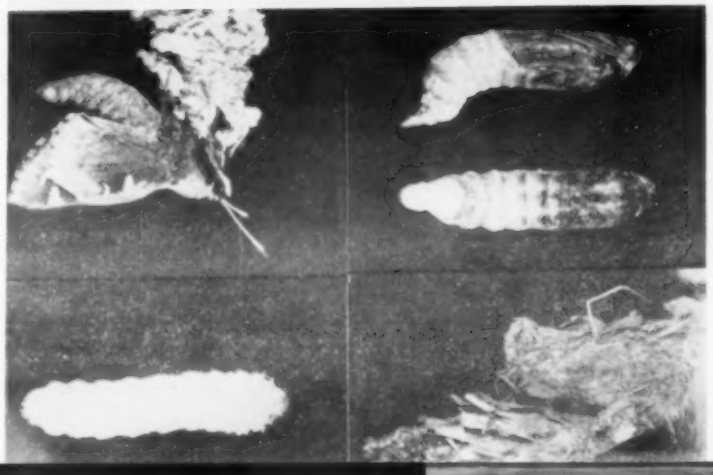
Dr. Smith, who is an accomplished photographer, considered the title of "Use of Audio Visual Aids in Entomology" with the various ramifications of the topic which came to mind, such as Black and White Still Photography; Color Photography—Slides, Film Strips, and Prints; and Cinematography and Television. Then, in order to give the program even more appeal, he came up with the idea of a Photo Salon, in which members of the branch could enter their own photographs. Dr. George E. Stone, member, Royal Photogra-

Honorable Mention—Black and White

Larvae of pea moth, "Laspeyresia nigricana" (Stph.) and damage to peas within pods. —Charles F. Doucette, Sumner, Wn.

Third Place—Black and White

Navajo yucca borer "Megathymus yuccae" Bvd. & lec. var "Navajo" Skin Showing injury (upper left) to young plant, larva (upper right), pupae (lower left) and adult (lower right) — Leland R. Brown, Los Angeles, Calif.



SALON

phic Society, and assistant professor of Photography, San Jose State College, San Jose California, was the man selected by Dr. Smith to aid him in working up the rules under which the Salon was to be conducted, and finally to judge the submitted pictures.

Two categories, Black and White, and Color were outlined. Pictures were judged on the basis of artistic and technical photographic excellence, photographic skill and knowledge necessary to take the picture, entomological interest and usefulness, and entomological ability and knowledge necessary to take the picture.

The response to the announcement and request for entries was most heartening, and a great deal of interest was shown by those in attendence at the Salon itself. We are told that the 1957 program will include a Photo Salon, so there should be increased interest next year.

Black and White Winners

First-place winner Dr. Cornelius B. Philip, principal medical entomologist, and acting director, Rocky Mountain Laboratory, U. S. Public Health Service, Hamilton, Montana, used a Leica camera with slide focusing attachment with front lens element removed, so the camera could then be attached to a monocular microscope equipped with an oil immersion lens system with a special grid in the condensor for oblique lighting, to bring out desired details in the specimen which was contained in a balsam slide mount. Film used was 35mm Panatomic X with fine-grain developing. Light was transmitted from below. It is interesting to note the subject of this photograph is one of the vectors of scrub typhus from New Guinea.

Second place winner William P. Nye, Entomologist, USDA Legume Seed Research Laboratory, Logan, Utah, used a Leica IIIf with auxiliary reproduction device and Elmar 50mm lens. The aperture was f/18 on Du-Pont Superior 35mm film. Illumination was by electronic flash, and the camera hand-held. The bee was alive, and because of the deep flower, it was necessary to pull back part of the petals in orders to get the correct angle to photograph the bee at work.

Third place winner was Dr. Leland R. Brown, assistant professor of entomology, Department of Entomology, University of California, Los Angeles. He used a 35mm Exakta VX with appropriate extension tubes to give the desired magnification, using a 50mm Zeiss Tessar lens. Light source was a "Thriftlite" speed-light, model AC-40, and extension lights at 45° from lens axis. "Specimens were laid directly on black velveteen cloth background, except for the adult moth, which was hand-held in front of the camera. These were originally photographed on 35mm Kodachrome daylight-type film at relative aperture of f/11 and 1/1000 second exposure. Kodachromes were copied at 1.0X mag. on Panatomic X film, and then enlarged, uncropped to 3.5X mag. on Varigam paper."

Honorable mention winner in this section was Dr. Charles F. Doucette, entomologist, USDA, ARS, Ornamentals Insect Research Laboratory, Sumner, Wn. He used a Korona View 5 x 7 camera with a 72mm Micro Tessar lens. Lighting was circular to eliminate all shadows. Film used was Panatomic X deveolped in DK 60a.

Honorable Mention — Color

"Chowtime," Tent Caterpillars on apple leaf — Charles H. Starker, Portland, Ore.

Third Place Color

"Mites and Webbing on Bean Tendril," magnified 0.5X —E. C. Kostermeyer, Prosser, Wn.

Color Winners

It is unfortunate that we were unable to reproduce each of these winning photographs in color, but we did the next best thing, which was to make a black and white negative from each color transparency, and then use these for the enlargements which served as the basis for the cuts used for this section.

(Continued on Page 114)

Photo at left: (standing, l. to r.) T. P. Hignett, TVA; W. Seiffe, Link Belt Co.; W. King, W. S. Tyler Co.; and A. Spillman, Fertilizer Manufacturing Cooperative Inc. (seated) executive committee of the Fertilizer Round Table: J. E. Reynolds, Davison Chemical Co.; chairman Vincent Sauchelli, Davison Chemical Co.; and H. L. Marshall, Olin Mathieson Chemical Co.

Photo at right: (standing, l. to r.) W. Jacobi, Union Bag & Paper Corp., Glen Rose, Davison Chemical Co.; O. W. McDuffie, International Paper Co.; (seated) E. Perrine, Nitrogen Division, Allied Chemical & Dye Corp. and J. O. Hardesty, USDA.

—Vote to Formalize FERTILIZER INDUSTRY ROUND TABLE—

TWO hundred sixty registrants and guests at the seventh annual meeting of the Fertilizer Industry Round Table voted to continue the annual gatherings of production men in the fertilizer industry, when they elected an executive committee to set up a formal organization. Dr. Vincent Sauchelli, Davison Chemical Co., who has organized the meeting annually since the initial gathering of nineteen persons in 1949, was requested to continue to act as chairman, and heads the executive committee. Other members of the committee are Herbert Marshall, Olin Mathieson Chemical Corp., and James E. Reynolds, Davison Chemical Co.

The 1956 meeting was held October 16-18 at the Hotel Shoreham, Washington, D. C., featuring some 32 speakers who discussed quality control, new developments in ammoniation and granulation, equipment and instrumentation in fertilizer manufacture, bags and bagging, and caking control in fertilizer. Moderating at various sessions of the three day meeting were Dr. Vincent Sauchelli, H. L. Marshall and James E. Reynolds. The Potash Co. of America acted as host to the entire group one afternoon at cocktails and luncheon.

In a review of "Changing Technology in Granulation and Ammoniation," T. P. Hignett, Tennessee Valley Authority, Wilson Dam, Ala., reported on the production of granular, high analysis fertilizers from phosphoric acid and ammoniating solutions, advising that two advantages of the process are: unusually high analysis of the products and high water solubility. "Estimates show that the process is economically quite attractive when phosphoric acid is available at a favorably low price."

In an outline of TVA nitric phosphate processes by the continuous ammoniator method, Mr. Higett, observed that the fertilizer industry showed more interest in this process during the sulfur shortage, but less interest since the sulfur supply has become adequate. Only two nitric phosphate plants have been built, he said, with one more now under construction. Mr. Hignett outlined tests made in the TVA continuous ammoniator pilot plant which showed that this equipment can be used instead of the slurry-type ammoniation and granulation steps of the original process. He indicated that use of the TVA method eliminates most of the disadvantages of the original nitric phosphate process, and the equipment is versatile enough so that it can be used alternately for nitric phosphate and conventional processes. "The process should be economically quite advantageous to manufacturers who can adapt their present plants to use it if they can obtain nitric acid at a reasonable price."

In further discussion, Mr. Hignett discussed the production of granular non-nitrogen grades of fertilizer, ammoniation and granulation in a pan granulator, superphosphoric acid in granulation processes, and caking of granular fertilizers.

Further developments in ammoniation and granulation were outlined by E. Perrine, Nitrogen Division, Allied Chemical & Dye Corp., whose address is published in full on pages 36-37 of this issue.

"The complete elimination of caking in granulated fertilizers" as phrased by E. P. Hudson, Ltd., Edinburgh, Scotland, was reviewed in a discussion of the experiences of the Scottish Agricultural Industries, Ltd. Pointing out the following essential difference in production methods between U. S. and those in Scotland, Mr. Hudson stressed a continuous balanced operation, with a minimum

of stoppages, for optimum results. The essential differences, "and they are related," he said, are: "first, we work on a water soluble basis for assessment of P_2O_5, and second, the nitrogen component of our mixed fertilizers is derived almost wholly from sulfate of ammonia.

"Our granulation process is in consequence, a simple as-it-were 'conventional' type, whereby single superphosphate and other solid salts are mixed, the mixture wetted with water only, and in the cold, and then granulated by tumbling or rolling or stirring . . . the resultant product being dried, cooled and screened. We have produced fairly large tonnages of mixed fertilizers which have been lightly ammoniated with straight ammonia solution, but none of our practice involves the hot reaction processes which have been adopted in recent years in the United States."

Mr. Hudson announced that after considerable work on process development and control, a firm figure of 30% relative humidity for the drying specification together with steady operating conditions have resulted in free flowing fertilizers.

Raw Materials Symposium

A REVIEW of raw materials used in processing granulated fertilizers included comments by R. D. Taylor, National Potash Co., Joseph Sharp, Spencer Chemical Co., J. O. Hardesty, and W. L. Hill, both of the USDA.

The physical nature of the raw materials is largely responsible for the compliance of the product to the requirements of: free flowability, uniformity of composition, and ease of distribution," remarked R. D. Taylor. Continuing, he reported that particle size is a particularly important factor.

"As shown by Mr. Hignett and others, increasing the potash particle size does help granulation efficiency, particularly high potash grades. The extent is dependent to a considerable degree upon the efficiency of the ammoniator and the preceding equipment as mixers. The more positive the mixing action, the less the effectiveness of coarse potash as compared with fine potash. Mr. Taylor completed his observations with comments on the relative merits of coarse and fine potash in making granulated fertilizer.

Characteristics of nitrogen material were described by J. Sharp, Spencer Chemical Co., who presented data on the comparative tendency of important fertilizer materials to absorb moisture, and a chart illustrating the solubility of pure fertilizer salts in water. Discussing the charts and data, Mr. Sharp reviewed means of lowering moisture in the ammoniator, so that higher temperatures may be employed . . . Two means, he said, which have been used to some extent are: to lower the moisture content in the raw materials, or to use a dryer recycle. He offered Spencer data on both systems.

Effects of phosphorus on granulation and in processing mixed fertilizers were described by W. L. Hill, USDA, while John O. Hardesty, also of the USDA, reviewed "Particle Size Effect of Potassium Chloride on the Processing of Granular Mixed Fertilizers." Mr. Hardesty said in part:

"Observations by the fertilizer industry corroborated by experimental work at the laboratory of the USDA, Beltsville, Md., indicate that potassium chloride in some types of mixed fertilizer appears to resist agglomeration with other ingredients during the granulation process. This difficulty is less apparent in high-nitrogen than in low-nitrogen mixtures. High concentration of salts, such as ammonium nitrate or urea, in the solution phase is characteristic of high-nitrogen mixtures and is one of the most important conditions favoring agglomeration of potassium chloride with other ingredients of the mixture.

"Such high-nitrogen mixtures as 8-16-16 and 10-10-10 usually can be granulated without difficulty. On the other hand, low-nitrogen, high-potash mixtures, such as 4-16-16 and 5-20-20, are often difficult to granulate, largely because the low proportion of nitrogen in such mixtures does not permit the use of sufficient amounts of highly-soluble nitrogen carriers. These mixtures may have inadequate plasticity owing to low concentration of salts in the solution phase. As a result, the potassium chloride complement of the mixtures, which is the least amenable to agglomeration of any of the materials present, is not fully incorporated in the granule. Thus a considerable proportion of it appears as individual particles of potassium chloride in the granular product.

"When the potassium chloride in a 5-20-20 mixture is finely-divided, (96% passing a 35-mesh screen; Tyler Standard Screen Scale) a high proportion of potassium chloride tends to accumulate as fines in the granulator product during processing, often causing excessive recycle loads and interfering with production of on-size product. When the potassium chloride in the initial mixture is composed of coarse granular material, (100% passing a 6-mesh and 92% remaining on a 20-mesh screen) a high proportion of the individual granules of this salt accumulates in the on-size fraction of the product, allowing possible segregation and poor nutrient distribution. When the potassium chloride in the initial mixture is composed of medium-size granules (92% in the range of 10 to 35 mesh) the quantity of fines, or recycle material, obtained during processing is reduced appreciably, as compared with that obtained when finely-divided potassium chloride is used in the initial mixture. Plant nutrient distribution in the on-size product is fairly uniform.

"Industry observations and results of laboratory tests indicate that granular potassium chloride, intended for use in fertilizer mixtures to reduce the amount of recycle fine fraction in the granulated product, preferably should pass a 10-mesh screen."

Symposium Reviews Drying Principles

FUNDAMENTALS of drying and cooling granular fertilizers, were outlined by E. J. Leister, Renneburg & Sons, F. T. Niellson, International Minerals and Chemical Corp., and D. Spence, Smith-Doug-

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Aerial sprays vs dusts — reviewed at WACA Convention

HENRY C. Moore, president of the Agricultural Aircraft Association, Inc., urged agricultural chemical manufacturers to encourage the use of sprays rather than dusts through their salesmen and dealers when he addressed the annual meeting of the Western Agricultural Chemicals Association October 9th at the Villa Hotel, San Mateo, Calif.

Mr. Moore explained that dusts must be applied during the early morning or late evening in calm air to avoid drift and rising air currents which would dissipate the pesticides being applied. This not only limits the air hours for crop dusting planes, he said, but also forces pilots to fly during hours of minimum visibility. Visibility is also often further obscured by the dust itself. Air spraying, on the other hand, can be done all day long and keeps the expensive equipment operating.

Mr. Moore said that a further advantage in the use of sprays is in handling. Sprays can be loaded faster, and do not present the same acute problems of contamination that are encountered in handling poisonous dusts.

Advantages of sprays to the farmer, continued Mr. Moore include a lower cost of application and higher rate of chemical actually reaching the crop. He claimed it is difficult to get an even distribution of dust, because the rate of flow varies with the amount of dust in the hopper and the action of the plane. He admitted, however, that dust will penetrate better in some cases,—such as in control of leaf roller on grapes. Also, after the grapes are formed, dusts must normally be employed, as sprays would cause spotting.

From the standpoint of the dealer, Mr. Moore pointed out that transportation costs on sprays are usually much less, since they have only about half the bulk of the dust necessary for the same job.

Mr. Moore feels that the opinions of the authorities will carry a great deal of weight in future decisions on sprays versus dust for aircraft applications. He said that, in addition to the usual complaints regarding dust drift to adjoining lands, contaminating livestock and crops, some California authorities consider drifting insecticides as one of the many causes of smog. Health authorities are considering a plan to limit air dusting within a half mile radius of adjoining area, a 300 feet limit for air spraying and 150 feet with a ground rig wherever poisonous insecticides are used.

Mr. Moore observed that agricultural aviation is a major business in California, with over 1,000 aircraft currently in use. The planes cost an average of $10,000 each today as compared with only $3,000 ten years ago—so it is necessary that, for the most part, sprays be used to keep this equipment working. In addition to urging agricultural chemical manufacturers to push the use of sprays—he counseled them to develop new and improved sprays for better controls.

A. F. Kirkpatrick, president, presided over a capacity attendance and C. O. Barnard, executive secretary-treasurer introduced the speakers at the luncheon session.

Harvey Banks, director of the Department of Water Resources for the State of California explained the aims of this newly created department for the control, distribution and utilization of water in all areas of California. The department has just completed nine hearings throughout the state — to discuss the California Water Plan which will be presented to the state legislature in January, 1957, as a master plan through which federal, state, local and private water plans can be integrated to solve California's water problems.

Points which were emphasized in the hearings were the need for immediate physical projects—dams, conduits and irrigation systems, and the need to provide financing on a state wide basis. The advisability of diverting surplus water from northern to southern California was discussed along with the need for smaller local projects to solve purely local water problems.

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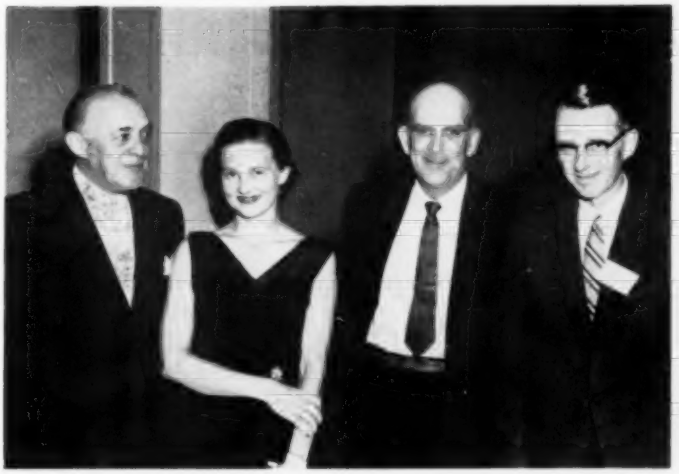
CAROLINAS - VIRGINIA PESTICIDE FORMULATORS ELECT J. M. MAXWELL

CONSIGNMENT SELLING CRITICIZED



Congressman Harold D. Cooley (D., N. C.), keynote speaker; Mrs. W. R. Peele; J. M. Maxwell, Maxwell Insecticide Co., newly-elected president; and W. P. Crown, Carolina Chemical Co., past president.

THE Carolinas-Virginia Pesticide Formulators Association, at its annual meeting Oct. 8-10 at Holly Inn, Pinehurst, N. C., heard Congressman Harold D. Cooley (D., N. C.), chairman of the House Committee on Agriculture, call for equalization of Soil Bank payments to adjust low payments to cotton and peanut farmers. In what he termed a "non-partisan" address, Mr. Cooley said that "Our leadership of the free world is based on our farm economy . . . North Carolina has more small farms than any other state," he declared, emphasizing that any limitation of the farmer's profits and buying power would be felt in every phase of the national economy.

The Carolinas-Virginia Association elected a new slate of officers and directors for 1957, headed by J. M. Maxwell, Maxwell Insecticide Co., Raleigh, who was named president. Other officers include: George Simches, Planters Chemical Corp., Norfolk, Va., 1st vice-president; John Daly, Daly-Herring Co., 2nd vice-president; and W. R. Peele, W. R. Peele Co., Raleigh, who was reelected secretary-treasurer. Frank Reid, Quality Chemical Co., and John Thompson, Graham Chemical Co., were elected new directors of the association.

In an open discussion at the close of the formal program, several formulators condemned consignment selling and guaranteed sales merchandising. Instances were cited in which the formulator suffered serious setbacks when obliged to extend credit memos for returned goods, and an opinion was voiced that pesticide products are commodity items and should not be sold on consignment.

Dr. J. H. Cochran, Clemson College, Clemson, S. C., gave an "Entomological Research and Control Problem Report for South Carolina," outlining recent important developments within that state. Discussing the resistance problem with the cotton boll weevil, Dr. Cochran declared that "there is an increased body of evidence that these insects are attaining high degrees of resistance to some insecticides."

"In certain localized areas where we don't get control," he said, "it has required up to 70 times as much endrin to kill weevils in these areas as in others." However, he reported good promise in South Carolina with systemic insecticides on cotton, especially for control of aphids and thrips.

On the subject of cattle pest control, he pointed to an increase in the number of self-rubbing devices—using solutions of 5% DDT, 5% methoxychlor, or 5% malathion in oil—as having given excellent control of horn flies and lice on cattle. Of the various devices, he declared that the inverted

K. Holden, Chemagro Corp.; K. Krausche, Floridin Co.; and W. S. James, Chemagro Corp.

J. Plowden, H. Lee, and Dr. George Ferguson, all of the Geigy Co.

T. E. Lytle, Shell Chemical Co.; Dr. J. H. Cochran, Clemson College; and W. H. Burnside, Hercules Powder Co.

W. Feustel and W. Gehweiler, Vanderbilt Co., and K. Wilson, Tobacco Network.

Mr. and Mrs. E. L. Phillips, Glendon Pyrophyllite Co.; and A. E. Leavitt, Apex Chemical Co.

A. Cutler, Daly-Herring Co.; R. L. Hendrix, Shell Chemical Co.; John Daly, Daly-Herring Co.; and T. E. Lytle, Shell.

W. P. Crown, Carolina Chemical Co.; Dr. J. H. Cochran, Clemson College; Dr. Clyde Smith, N. C. State College; and W. R. Peele, W. R. Peele Co.

F. K. Ross, A. B. Shaw, and R. Coward, Diamond Alkali Co.; A. W. Fuchs, Atlas Agricultural Chemicals; R. B. Perry, F. A. Craine, R. J. Orlik, and J. W. Kennady, all of Diamond Alkali.

V-type has proved most effective for control of lice. Of the cattle grub control insecticides, he listed rotenone as still the recommended one, but declared that Dow ET-57 has also exhibited "considerable promise."

For corn insects Dr. Cochran said that a high degree of control of the bill bug can be obtained by applying aldrin as a broad cast treatment and disking it prior to planting, and that DDT in oil continues to be the best control for the corn earworm on sweet corn.

Among the chief projects undertaken recently in South Carolina, he listed pesticide residues, distribution and identification of economic insects, and development of bioassay techniques to determine pesticide residues. He described also control programs of the S. C. State Crop Pest Commission for the white fringed beetle, sweet potato weevil, Japanese beetle, and phony peach disease.

DR. Clyde F. Smith, head of the entomology division, N. C. State College, stressed the importance of recognition, evaluation of damage and other key factors in disease control. He declared that a major education problem exists for the manufacturer and formulator of pesticides. "The farmer must be educated to check his fields constantly for crop damage, and to apply the pesticide correctly. Correct application gives good control, zero or near zero residues, minimum expense to the grower, and minimum danger to the operator."

Turning to work being done at N. C. State, Dr. Smith described studies being conducted on the habits of beneficial insects, the honey bees, and other pollinating insects and the parasites and predators. "In a field of squash melons," he advised, "we have observed as much as 50% increase in yield as a result of bee hive maintenance."

Dr. Smith's opinion on "resistance" differed from that of Dr. Cochran of South Carolina. "In North Carolina we don't feel we have the evidence to indicate resistance by the boll weevil to any of the materials

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Fertilizer Phosphates on Calcareous Soils

By P. Boischot and Melle G. Sylvestre*

Nat'l Inst. Agron. Res. Central Agron. Sta. Versailles (Paris)

SUMMARY

IN the presence of calcium carbonate the tricalcium phosphates (natural rock and bone) lose their solubility completely: their P_2O_5 is rendered inassimilable to plants; therefore they have no place in the fertilization of calcareous soils.

The soluble phosphates diffuse in the soil moisture with the following consequences:

1) a part of their P_2O_5 becomes fixed by clay.
2) a part is precipitated in the form of a gelatinized phosphate.
3) when circumstances are favorable, a part of the gelatinous phosphate becomes hydroxyapatite, which is only slightly utilizable by plants.

That part remaining in the form of a gelatinous phosphate strikes up an equilibrium with the soil solution and dissolves to the extent and in an amount equal to the P_2O_5 of the solution absorbed by plants or fixed by the $CaCo_3$.

In effect, the P_2O_5 of the solution is fixed by adsorption on the sand lime granules. The phosphoric acid thus immobilized can again become available to the roots as it re-enters the soil solution by a phenomenon of inverse desorption.

The fixation of P_2O_5 upon the lime-coated sand creates as a consequence a phosphorus reserve available to plants at all times.

Phosphatic fertilizers should be used in cultivated and humid soils, conditions which facilitate their diffusion.

Phosphatic fertilizers which are the most soluble should be selected. These are, in order of rank: superphosphate, dicalcium phosphate, basic slag: the tricalcic phosphate (natural raw rock and bone) are definitely not in this class and are not to be used on calcareous soils.

Soil testing techniques for determining the dosage of assimilable P_2O_5 should avoid the use of extractive acid reagents which destroy the calcareous skeleton of the soil.

INVESTIGATORS using the nutritional solution technique have determined that a plant's minimum requirements of phosphorus can be satisfied by very dilute solutions, say one milligram P_2O_5 per liter (roughly, one part in a million). They also learned that plants always benefit from applied phosphate up to a solution concentration of about half a milligram of P_2O_5 per liter which is the minimum required for plant nutrition. At any rate, the yield of a plant can be progressively increased by concentrating the phosphate right up to a maximum of one milligram per liter. Beyond this amount, the crop response seems to be nil and no useful purpose is served. Hence, it can be stated that the basis of a phosphatic fertilization consists in maintaining in the soil solution a concentration of phosphorus within the limits just indicated.

To do this, a great deal more depends *upon the medium in which the phosphate fertilizer is introduced than upon its solubility in water,* because reactions can and do occur in the soil which may increase or diminish the solubility of the phosphatic fertilizer. (Italics mine. V.S.)

Phosphate losses through action of the deeper soil layers are exceptional. Some workers report such losses in slightly acid soils in which iron and calcium do not influence the retention of P_2O_5 (1,2).** As to this effect, little attention should be given it generally and particularly as regards calcareous soils.

When the phosphatic compounds formed in the soil are not completely insoluble, an equilibrium is established between them and the soil solution with the result that the concentration is maintained appreciably constant, (3) despite absorption by plants and variations in soil moisture content, so long as the mass of the compounds remains adequate.

This explains why it is possible for plants to have enough phosphorus for their requirements for a long time in a soil that has a normal supply, even in the absence of fertilization, and even up to the point where the supply is almost entirely depleted. (4). Under such conditions the principal concern which can influence the use of phosphatic fertilizers on calcareous soils is the rate of diffusion of the phosphoric acid and the compounds formed by the soil constituents with those of the applied phosphatic fertilizers. A review of these conditions may enable us to judge if the methods used generally for determining the assimilable P_2O_5 will also apply to calcareous soils.

*Translated by Vincent Sauchelli.

Diffusion: A study of the behavior of superphosphate in an agar-agar plaque (5) has shown that on contact with the soil solution and in the absence of all movement of the moisture a more or less extensive zone is formed round each soluble granule of phosphate, depending on the size of the granule, in which the phosphoric acid persists temporarily in a soluble form. Then, as it diffuses, another fraction precipitates as dicalcium phosphate in the alkaline medium which lies farther away from the granule. If no material is present capable of fixing the phosphoric acid, it will diffuse rapidly throughout the entire mass. This behavior is not the same as that in a soil in which clay, lime, or especially free iron may attract and fix the phosphoric acid.

Lime does not cause a complete precipitation of the phosphoric acid, a portion of which remains in solution so long as the pH is not too alkaline (8-9 at a maximum) and the concentration of the solution remains weak (0 to 3 mg. P_2O_5 per liter). (6, 7).

Compounds

EXPERIMENTS designed to judge the effectiveness of different fertilizer phosphatic materials have been numerous. Many of the results have been at times variable

and even contradictory because the experimenters concentrated on the kind or type of phosphate fertilizer and took little or no account of the nature of the soil. They have merely shown that the presence of a certain amount of calcium carbonate made it impossible to put tricalcium phosphate (the natural phosphates and bone) into solution. And of course such phosphates are not recommended for use in lime soils (8).

It was not until 1923 that the laboratory research of Demolon (9) gave us an accurate account of the action of calcareous soils on different phosphatic compounds used as fertilizers. This scientist showed that the amount of soluble phosphate in soils is subject to considerable depletion, but calcium carbonate exerts a protective action which limits such depletion; furthermore, the observed decrease in solubility is due essentially to the action of the iron salts present. These conclusions, confirmed by other investigators (1), do not conform to the old theory that superphosphates reverted and lost their solubility because they were converted to tricalcium phosphate in the presence of calcium carbonate.

It has been proved (11) that, in a calcareous soil, a relatively concentrated solution of P_2O_5 such as may be found in the immediate proximity of a soluble phosphate does not react with the calcium salts present to form an insoluble tricalcium phosphate — something quite difficult to show in the laboratory. Rather it forms a complex, gelatinous phosphate, the so-called phosphate of Berzelius, which remains largely soluble in water, especially water charged with carbon dioxide (CO_2). This gelatinous phosphate, goes into solution in the soil liquids and diffuses through all of the soil capillary channels. The concentration of the solution and the pH of the calcareous soils comprised between pH 7 and 8.2 create a medium in which precipitation cannot occur when the solutions contact fresh quantities of calcium carbonate. But some fixation does occur on the surface of the calcareous sand granules. This fixation is caused by adsorption on the surface of such granules and is subject to the laws governing such phenomena (12, 13). The P_2O_5 thus fixed is not lost to plants however, because the neutral mineral salts and especially, the organic salts, humates in particular, can cause it to go into solution again (14), thereby making it available once more to plants.

When a persistent dry spell lowers the soil moisture below the retentive capacity of the soil, a portion of the gelatinous phosphate may, in time, form apatitic compounds which are practically insoluble. This fractional quantity of transformed P_2O_5 diffuses extremely slowly if at all and does not take part in the reactions previously described.

In this review of soluble phosphates we are concerned with the lime and not the clay portion of the soil. It is obvious that, at the moment the fertilizer dissolves, some portion of its P_2O_5 is fixed by the clay colloidal complex (15), thus diminishing by that amount the fraction which reacts with the lime. The study of the CO_2 solubility of different phosphatic fertilizers in the presence of lime (16) ranks superphosphate first, followed closely by dicalcium phosphate, then the slags and finally the natural raw phosphates and bone meals whose solubility is almost nil.

The mechanism of the diffusion and of the fixation phenomena previously described (5) makes it logical to classify phosphatic fertilizers according to the following scale of solubilities first established by Demolon:

Superphosphate, 94;
dicalcium phosphate, 68;
basic slag, 23;
phosphate rock and bone, trace.

Slags

GRANTING that the dissolution of slags in a soil is a slow process, nevertheless, the concentration of their solutions is definitely greater than the P_2O_5 content of the straight soil solution; but the reactions which follow their solubilization are identical with those obtained with soluble phosphates (17). It has also been shown (18) that the effectiveness of the slags can be increased appreciably after they have been in the soil for some time. Consequently, when a phosphatic fertilizer is applied to build up the soil's reserve of useful P_2O_5 and not to feed the current crop, slags may have an advantage approaching that of soluble phosphates. This can be appreciated by recalling what was said previously in connection with the effect of CO_2 in the soil solution on the solubilization of phosphatic compounds.

Determining Available P_2O_5

THERE are a number of methods for analyzing for available P_2O_5, and the reagents used for extraction differ from country to country. The method currently used in France, Schloesing de Sigmond, breaks down the calcium skeleton of the soil, and is rather unsuitable for use with soils that are rich in $CaCO_3$ (19). The same restriction applies to all methods using an acid reagent. The correlation between the amount of assimilable P_2O_5 determined and its utilization by plants (20), is not strict nor constant, but in the analysis the lime on whose surface the absorbed P_2O_5 is fixed certainly should not be destroyed by the reagents of the method. Therefore, it is preferable to determine the assimilable P_2O_5 either by the biologic methods (Mitscherlich, Neubauer, or Cunninghamella (21)), or by chemical methods which employ a neutral or alkaline salt as reagent, such as ammonium citrate (Aubert), potassium carbonate (Hockensmith), lactate (Egner), water after adding increasing quantities of monocalcic phosphate (Tommasi and Marimpietri), or ammonium oxalate, as proposed by Joret and Hébert.

Conclusion

THE application of phosphatic fertilizers to calcareous soils should be done so that diffusion can take place under the best possible and knowable conditions: this means (a) a fertile soil, that contains and receives moisture at times, and (b) using fertilizers which are easily soluble, as indicated by the following list ranked in a descending order: superphosphate, dicalcium phosphate, basic slags. Tricalcium phosphates (phos-

(*Continued on Page 119*)

Some comments on insecticide research investigations and views on future trends in pest control

THE mutual agreement among entomologists from all parts of the world on the urgent need for research to combat the increasing problem of resistance most impressed Dr. W. E. Ripper, vice president of Fisons Pest Control, Ltd., Cambridge, England, as he participated in the recent International Congress of Entomology. On his return from this meeting in Montreal, Canada, Dr. Ripper was interviewed by *Agricultural Chemicals*. We are pleased to have the opportunity to report some of his comments on the Congress, and views on pest control in general.

Dr. Ripper observed that the future of pest control may lie in a cooperative use of chemicals, attractants, and biologic measures of control. The increasing number of strains of insects which have become resistant to the very insecticides found at one time to be very effective, somewhat discourages exclusive study along this line, he said, — particularly, since the insect physiological system seems to learn resistance so rapidly that even new chemicals do not combat the pests for long before "detoxification."

Elaborating these points, Dr. Ripper referred to comments by Dr. A. W. A. Brown of Montreal, who recently reported that one of the most resistant pests encountered in the entire agricultural field is a strain of the red spider mite, which has become resistant to 80 different types of chemicals. This sort of development, Dr. Ripper observed, is extremely disconcerting in view of the inevitable high cost of developing new commercial control chemicals — upwards of a million dollars from the laboratory to field use. "That's a lot of money to invest in a chemical which may follow the same resistance pattern of so many of its sisters on the pest control market," Dr. Ripper commented.

The cost of research, — and the cost of field testing are factors which weigh heavily in the consideration of setting up new production facilities, direction of future expansion programs, and appropriation of funds for equipment, research and development.

As vice president of Fisons Pest Control Ltd., and as a member of its board of directors, Dr. W. E. Ripper, like most manufacturers and company executives, must anticipate future trends, and weigh carefully all pertinent factors when proposals are reviewed concerning construction of additional manufacturing plants (local and abroad), enlarging facilities, and appropriating funds. Dr. Ripper observes that the development of new chemicals is not to be discouraged; however, such an investment of corporate funds necessitates some guarantee on the return, because of the critical effect on the future of the company.

Dr. Ripper suggested that attractants will have a prominent role in future programs of pest control. He referred to a report by Erich Hecker of Germany on the isolation of the sex attractant of the female silk worm, and close simulation of this material, — of which cholesterol appears to be the main constitutent. Also of interest, he said, is research on insect hormones. He referred to work by Carrol M. Williams of Harvard University, Massachusetts, whose studies on the isolation of the "juvenile hormone" in the silkworm

W. E. Ripper

show promise of the discovery of a new and effective insecticide. According to Dr. Williams, "This prospect is worthy of attention because insects can scarcely evolve a resistance to their own hormone. Dr. Ripper expressed belief that continued research on attractants and hormones will result in very successful tools in pest eradication.

Dr. Ripper some eleven years ago developed still another solution to pest resistance — the theory of "balanced arthropod populations*," whereby selective insecticides are used in pest control in such quantity that only a calculated percentage of the crop pests is destroyed,—the remaining pests being in such quantity that they can be controlled by the natural predators. The pest is not so much reduced that the natural predators are discouraged from remaining in the area, — the overall system effecting a "balanced population." In such a system, Dr. Ripper points out that development of resistance is avoided, since "strong, resistance-developing pests" never result.

*"Effect of Pesticides on Balance of Arthropod Populations," W. E. Ripper. *Annual Review of Entomology*, Vol. I, pp 403-438, 1956.

In demonstrating the validity of this theory, Dr. Ripper has successfully conducted a test farm in South Africa employing the principle of this "natural balance" of controls. The same theories have been put to practical test on a nation-wide scale in growing hops in Great Britain. Schradan, because of its physiological selectivity, is used on a field scale against aphid outbreaks on annual crops and is accepted as a regular treatment on certain permanent crops. Over 90% of British hop acreage, he continued, has been treated with Schradan for the last six years with very good results.

The use of this selective systemic insecticide, he said, has meant a sizable reduction in the number of pesticide treatments required to control the hop aphid, and the hop red spider mite.

In addressing the International Congress, Dr. Ripper reviewed some of his experiments on the intergration of biological and chemical control. In another address at the meeting, he reported on the role of commercial application and professional supervision in insect control operations. In this connection, it is interesting to learn of some of the practices in commercial pesticide application in England.

One system, which he described as a "hiring system of equipment with obligation to buy all chemicals from that source," has no exact counterpart in the United States, and thus no true descriptive term. The group involved rents to the farmer for a very small fee any crop application equipment he may require, — including all forms of ground application equipment. The farmer, in return, is obligated to purchase all of his chemicals from this supplier. The supplier gains his profit from purchase of chemicals at special prices from the manufacturer. In addition, this supplier provides an advisory service to the farmer and may suggest control measures. On the other hand, since the farmer himself applies the control chemical, there is no doubt in his mind as to what and how much chemical was applied.

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Control Officials Cautioned

THE tenth annual convention of the Association of American Fertilizer Control Officials at Washington, D. C. was advised to proceed cautiously with their proposed change to the elemental basis in labeling fertilizers. Dr. W. F. Price, general manager of the Plant Food Division, Swift & Co., Chicago, cautioned that previously-secured endorsements to the change are "from groups that do not have to grapple with the problems at the grass roots, such as the county agents and farmers groups."

Dr. Price was one of a number of industry and control official speakers at the fertilizer control officials Oct. 19 meeting, the best attended in the association's history. The fertilizer officials conference was followed Oct. 19-20 by the tenth annual meet- of the Association of American Pesticide Control Officials, with membership in each association largely identical. The two meetings were the last of a series at the Shoreham Hotel during the week of Oct. 15-20, beginning with the Association of Official Agricultural Chemists Oct. 15-17 and including the Association of American Feed Control Officials Oct. 17-18.

Dr. Price suggested that "many members of the fertilizer industry are not aware that such a serious change is being contemplated." He advised that the officials first ask themselves whether such a change can be effected without chaotic conditions? He said that the chief appeals of the change, which he listed as "uniformity, simplicity, and accuracy," have obvious appeal to agronomists and teachers, and to administrators; but then posed the question: "What about the reaction of the National Association of County Agents, the vocational agri-

Newly-elected officers and executive committee of the Association of American Pesticide Control Officials: Seated are Clyde A. Bower, Oklahoma, retiring president; H. J. Fisher, Connecticut, president; and F. H. Gates, Colorado, vice-president. Standing are J. T. Coyne, Washington, D. C.; A. B. Heagy, Maryland, secretary-treasurer; E. A. Epps, Louisiana; and W. C. Geagley, Michigan.

on Premature Labeling Change

Newly-elected officers and executive committee of the Association of American Fertilizer Control Officials: Seated are J. J. Taylor, Florida, vice-president; J. D. Patterson, Oregon, president; and B. D. Cloaninger, South Carolina, secretary-treasurer. Standing are M. P. Etheredge, Mississippi, retiring president; E. A. Epps, Louisiana; C. Marshall, Canada; F. W. Quackenbush, Indiana; and S. B. Randle, New Jersey.

cultural teachers, and yes, the farmers themselves?"

Using as a hypothetical example the situation that might result should North Carolina and Georgia approve the change, and South Carolina disapprove elemental labeling, he advised: "Being sure that most of the states will go along is *not enough*. Each control official must be sure that his state will definitely make this change at the target date. The alternative to this is chaos."

"We need more reaction from down on the farm. We need the reaction of the plant food dealer. Will the elemental change simplify his explanation of the experiment station recommendations to his customers and will it increase his business?" . . . In my opinion, any move to complicate the dealer's business, however temporary the complication, would not gain his support."

Dr. Price then pointed to the present economic difficulties farmers are experiencing, advising that the major educational effort required to change fertilizer labeling practices to an elemental basis might be better applied to directing the farmer toward efficient fertilizer use.

He further questioned the timeliness of the measure at present in view of the most recent poll of control officials on the proposed change: "You were polled as to your attitude on several questions involving this change. Only two states could change without legislation. And of the 41 states returning the questionaire, 18 were not sufficiently enthusiastic to poll their own control group as to those favoring and those not favoring. Four states said 'all' persons in their group favored. One said 'all' had no preference, and in the 18 states remaining, 41 people favored the idea, 27 opposed, and 10 had no preference. Certainly, *this is far from enthusiastic response* to a proposal favored 18 to 1 among agronomists."

With the exception of another industry protest, (this one during a report to the States Relations Committee by S. B. Randle, of New Jersey, on the provisions of the new bill) members of the Fertilizer Officials group generally favored early proposal of the new bill to their respective legislatures. The second protest, by a spokesman for Allied Chemical & Dye Corp., New York, charged that the change would "open up possibilities of twisting, crippling amendments, and end up with a hodgepodge."

A. B. Lemmon, of California, defended the bill from the floor on the grounds of the existence of a real need for uniformity in fertilizer designation. "Our model bill is a good way to get that uniformity," he declared.

AS had occurred the previous year, the association's states relations committee held a round table discussion on a number of control questions. The group was divided on the question of "Should guarantees be required for both total and water-soluble magnesium?", with about half the 10-man roundtable favoring one method and half the other. In a summation, however, the group agreed that no adequate chemical means exists to determine water-soluble magnesium.

On the question: "Should secondary elements (such as calcium and sulphur) that are normally present in all fertilizer mixtures be permitted to be guaranteed?", the committee agreed that, whether added or not, these minor elements should be treated the same. On the question of whether there should be a restriction on the number of minor or secondary elements which may be guaranteed, the members decided that only those elements "significant in influencing plant growth should be listed." Mr. Lemmon said that this policy in California had been effective in curbing manufacturers who began the practice of listing gold, silver, and other minerals of doubtful agricultural

NPFI representatives greeting B. D. Cloaninger, secretary-treasurer of the Assn. of Fertilizer Control Officials, at a dinner given the officials by the NPFI. Left to right are Russell Coleman, executive vice president of the NPFI, L. H. Wilson, NPFI, Mr. Cloaninger, and Paul Truitt, executive vice-president of NPFI.

value on the labels of their fertilizers.

Introducing the proposed changes to the "Model Bill," S. B. Randle said it was an attempt to make it possible for different states to change over at the same time. "I don't see any way possible except in something similar to this model bill," he declared. Main provisions of the bill are slated to go into effect July 1, 1960, and Mr. Randle said that until that date nothing would actually change except an additional listing of available phosphorus and soluble potassium.

In the formal meeting, Dr. Russell Coleman, executive vice-president of the National Plant Food Institute, declared that the fertilizer industry has a greater capital investment than any other billion dollar industry. He introduced a recently-produced NPFI film, "What's In the Bag," which gives a picture story of the fertilizer industry for the farmer or layman.

Dr. R. F. Poole, president of Clemson Agricultural College, Clemson, S. C., revealed the need for recruitment of youths for agricultural training in the immediate future. "If the positions in agricultural pursuits are to be maintained, the colleges and agricultural agencies must adopt another function of proselyting for students to take agricultural subjects." Speaking on "Functions of the Land Grant Colleges," Dr. Poole declared that other occupations are luring the youth away from agriculture. As new agricultural problems for the land grant colleges, he listed research on the minor elements, further education of farmers in proper fertilizer practices, and studies of marketing plant foods.

"Today the fertilizer salesman has to carry the burden of farm relief," declared Hugo Reimer, president of the Nitrogen Division, Allied Chemical & Dye Corp., New York, in an address titled "Industry is Serving the Public Interest." "It is up to the fertilizer industry to demonstrate to the farmer that, with enough fertilizer, he can raise his crop at a profit—even today."

"Through the 40-hour week and modern industrial developments and inventions," he said, "industry is giving man back to himself; enabling him to attain self-realization. . . . Industry is also serving the public by operating at a profit, for the profit motive is the lifeblood of the democratic system."

DR. F. W. Quackenbush, state chemist, Purdue University, Lafayette, Indiana, speaking on "Sampling Commercial Fertilizers," remarked that "we have not yet developed and proved a satisfactory method of sampling bulk fertilizer, especially bulk piles."

"We know far too little about which particle sizes will segregate and separate and which won't. We tend to undersample small particles, and oversample large particles." He cited a need for better equipment for sampling dry products, reporting that the riffle, most common equipment today, is too dusty. "Much work could be saved through a more systematic approach to the bulk sampling problem," he concluded.

Dr. Paul Sanders, editor of the *Southern Planter*, cited a general failure to recognize the farmer and his family as the bed rock of our economy. He remarked on the trend from farm to city, and the shift in agriculture from a way of life to a specialized highly complicated industry.

In a presidential address to open the meeting, M. P. Etheredge, dean of the School of Science of Mississippi State College, reported that as many as nine of the major agricultural chemical companies are among the billion dollar class. He traced the history of several of the major companies, then did the same for two of the smaller fertilizer companies in the South.

After hearing reports by the various committees, the members elected J. D. Patterson, Oregon, president; J. J. Taylor, Florida, vice-president; B. D. Cloaninger, South Carolina, secretary-treasurer. E. A. Epps, Jr., Louisiana, and Mr. Etheredge as president ex-officio, were named to the executive committee.

Pesticide Officials Meeting

THE pesticide control officials meeting began with an open states relations committee meeting on the evening of Oct. 19, with A. B. Lemmon, California, presiding. As had the fertilizer group, the pesticide officials used a panel discussion to stimulate audience participation.

On the question of standardization of pesticides, E. F. Knipling, chief of the Entomology Research Branch, ARS, USDA, called for closer discussions between formulators and experiment stations. He said that industry wants to limit the number of formulations too, and that a need exists for education from both directions.

A control official criticized industry for not "having time" for research on some of its products.

The group generally voiced disapproval of the suggestion that industry might have their salesmen carry new labels to use to replace obsolete labels, arguing that it tempts repackaging and the breaking and relabeling of large packages.

On the question "What progress has been made in finding new methods for removal of pesticides from crops?", it was decided that very little new had been discovered (with the exception of washing and scrubbing fruit) that would stand the scrutiny of the FDA. The group also decided that the registrant must bear responsibility in any re-selling of bulk lots of pesticide by dealers.

The safety record of the pesticide industry was lauded by Clyde A. Bower, Oklahoma, in a presidential address. He urged closer enforcement of existing laws, and pointed to small bulk sales as a real danger in the future. He charged that flagrant advertising claims, for pesticides such as "rids premises for all times" and "kills anything that flies, walks, or crawls," are giving the industry a black-eye in some states; and that the legislative apparatus for dealing with such fantastic claims is far too slow.

"PESTICIDES have saved growers billions of dollars and prevented illnesses and death for millions of people," Dr. Knipling declared, saluting the industry and control officials. "A wonderful job has been done in developing new materials, and

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Agricultural Chemicals Advertising; F-P Mixtures—Highlight N.J. Dealers Meeting

"FERTILIZER-PESTICIDE mixtures are not in the best interests of agriculture in New Jersey," declared Dr. Bailey B. Pepper, well-known entomologist of the Rutgers University Dept. of Entomology, in an address to the New Jersey Fertilizer Conference on Sept. 27 at the College of Agriculture in New Brunswick. "Such mixtures might be feasible for corn and forage crops," he said, "but our diversity of crops make them generally impractical for general recommendation in this state."

In addition to the drawback of the control factor involved in the large numbers and varieties of crops grown in New Jersey, Dr. Pepper listed other factors that weigh against any general recommendation of such mixtures by the state agricultural experiment station:

"1. The New Jersey farmer changes his pesticide usage determination too often to maintain the precision measurements necessary for use of the F-P mixtures.

"2. We have discovered cases of non-obeyance of labeling cautions on the part of farmers and their hired men.

"3. The grower is likely to overextend the area treated, to spread out the mixture too far.

On this last point, Dr. Pepper pointed out that "we have often found insect damage greater in lightly treated areas, than in the non-treated areas." He attributed this dangerous situation to the tendency of friendly insect populations (i.e., the larvae of the ground beetle) to be more susceptible to low dosage applications, than the pests at which the application is aimed. He described how killing off these friendly insects increased the populations of such destructive pests as the cabbage and onion maggots, and fly larvae.

"In dry fertilizer-pesticide mixtures, such as powdered superphosphate, we have found that wide variations often occur in distribution of the pesticide. Vibration in shipment tends to separate them . . . In many materials incorporated with fertilizers, and left standing three or four months, there is a sharp drop in efficiency due to various chemical reactions."

"The greatest misleading factor in the popularity of these mixtures has been the outstanding results in the Corn Belt — the use of dieldrin, aldrin, and other insecticides to control the corn root worm . . . The question in New Jersey centers about whether fertilizer is the best material for getting the pesticide where it is needed."

On the danger of putting in too much pesticide, Dr. Pepper described how plant tissues are altered in taste, appearance, and even chemical analysis by the application of too much pesticide. "This applies especially to such crops as snapbeans, turnips, and carrots. Carrot tissue will often run a higher pesticide content than the soil itself, and certain of these crops will absorb up to 25 times as much of one particular toxicant as they will of others. Turnips, for instance, will absorb a much larger amount of chlordane than will other crops." He declared that these factors complicate safety determinations for fertilizer-pesticide mixtures.

Recent Fertilizer Trends

E. C. Kapusta, director of technical service, U. S. Potash Co., New York, predicted that world population increases would bring demands for ever-increased quantities of plant food. Queried about the type of fertilizer, liquid, solid, or gas, that would predominate in the future, Mr. Kapusta declared, "Solids will probably continue to account for the major portion of fertilizers."

Of the principal fertilizer components, Mr. Kapusta listed nitrogen as having had the most "phenomenal expansion" in sale and use in recent years. He quoted USDA figures of 1.25 million tons produced in 1950-51 and compared this total with the '55-56 figure of 2.3 million tons. "This is an 80% rise in just five years," he pointed out.

He listed potash production as having registered the next most impressive increase, and gave production figures for that component as 1.3 million tons of K_2O in '50-51 (as compared with 1.9 million tons in 1955-56). This is an increase of 40%. Mr. Kapusta described trends toward higher analysis potash carriers in the last few years.

"Superphosphate has remained the prime use of phosphate, though there has been a increasing trend toward use of triple superphosphate. During the past few years, there has been a 70% increase in the use of this higher analysis phosphate, as compared with an increase of only 10% in the use of superphosphate."

Mr. Kapusta noted a great increase in ammoniation and granulation of mixed fertilizers. "Granulation has been the greatest factor yet in overcoming caking problems, "he said. "About 150 mixed fertilizer plants either have or are about to install granulating equipment, and I estimate that 15 to 20% of all mixed fertilizers last year were produced in a granulation process."

"Another interesting development has been the use of liquid fertilizers containing two or more components, particularly in California, Arizona, and Texas."

Modern Advertising

SIGURD Anderson, Commissioner, Federal Trade Commission, outlined to conference members the role of the FTC in curbing and prosecuting flagrant and misleading advertising. He praised the fertilizer industry for the relatively low number of warnings and prosecutions the commission has had to initiate against its members.

"No one is more gullible than the home gardener," he pointed out,

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Entomology Research in the USDA

*by E. F. Knipling**
Entomology Research Branch
U. S. Department of Agriculture

Editor's Note: This is the concluding part of the report by Dr. E. F. Knipling presented at the NACA meeting. Part 1 of this address appeared on Pages 52-53 in the October, 1956 issue of *Agricultural Chemicals*.

Biological and Ecological Studies

IN the conduct of entomological research it is essential to include insect biology and ecology. We admit that the estimated 7 per cent of the total budget that we devote to biological studies represents far too little attention to this phase of entomology. The success of any insect control program, regardless of the method employed, hinges on a thorough knowledge of the insect's life. A knowledge of the life history and habits, host-plant relationships, and disease-carrying potential of the beet leafhopper has made it possible to protect much of the vegetable-seed industry in Idaho. The recent discovery of a mite vector of peach mosaic may lead to the control of this virus disease through the use of sulfur. Certain knowledge regarding the life history and habits of the screw-worm — information that seemed academic at one time — suggested the research now under way that may lead to the eradication of this important livestock pest from the southeastern United States.

Classification and Identification

ONE of the vital functions of the Pest Branch is to obtain information and to prepare publications, particularly monographs, on insect classification. Our specialists in taxonomy identify insects for practically every agency in the nation and for many foreign countries. This phase of entomology requires about 6 per cent of our total effort. Most people do not realize that the function of our taxonomic specialists goes far beyond the mere identification of specimens. Whenever a new or little-known pest is found, they are the best source of information on the life history, host relationships, and distribution of the insect. If nothing has been published about an insect, the specialist through information on related forms can often predict with fair accuracy the probable life history, types of host plants, and original home of the insect. Such information is especially important in a search for parasites and predators. Even though most of us in entomology recognize the value of such services, it is extremely difficult to obtain adequate financial support to maintain classification and identification work at the desired level.

Insect-Resistance in Plants

THERE is probably no more economical or more desirable way to control insects than through the use of plant varieties that resist insect attack. This means of reducing insect losses, when incorporated in varieties having other desired qualities, is accomplished without cost to the grower, without creating a residue or other toxicological hazard, without damage to pollinating insects, and without upsetting nature's balance between host insects and their natural enemies. About 4 per cent of the Branch effort is devoted to this research. Entomologists work with plant breeders on this problem because insect resistance is just one of several qualities that must be incorporated into desirable plant varieties. Currently, cooperative research is under way on corn borer and corn earworm resistance in corn, hessian fly and wheat stem sawfly resistance in wheat, sugarcane borer resistance in sugarcane, and spotted alfalfa aphid and pea aphid resistance in alfalfa. The work that has already been done has proved highly productive. Wheats have been released that are practically immune to the hessian fly. Corn varieties are available that reduce corn borer losses by 70 per cent. At least one variety of alfalfa is known that is not seriously affected by spotted alfalfa aphid infestations which completely destroy susceptible varieties.

Pollination and Bee Management

THE honey bee and other pollinators are among our most valuable insects. Without their pollination activities many of our most useful crops could not be grown. The bee industry is becoming more and more concerned about the effects of extensive and intensive chemical control practices on honey bees. In selecting insecticides and in recommending spray programs, it is important that damage to bees be held to a minimum. The importance of achieving insect control without significant damage to pollinators will, I am convinced, stimulate research on insect control practices that protect these beneficial insects. The Branch program on bees is currently emphasizing research on the role of the honey and other bees in crop pollination. Although some effort is devoted to studies on the effect of chemicals on pollinators, the total effort is inadequate.

Cultural and Other Methods of Control

CULTURAL control, destruction of breeding places, general sanitation, destruction of crop refuse, and soil-management practices received far more research attention in the past than in our current program. For a cultural control program to be effective, it is often necessary to have community cooperation. The difficulty of obtaining sufficient participation in such programs is perhaps the chief reason for the poor acceptance of this method of insect control. We have an outstanding example of the benefits of a community-wide cultural control program in connection with the control of the pink bollworm on cotton. In south Texas, the Federal and State regulatory agencies require planting of cotton during the specified period, and post-harvest destruction of plants before a certain date. The absence of adequate amounts of suitable host material during the time when pink bollworm moths are active keeps the population at a low level. This practice, carried out primarily for controlling the pink bollworm, also greatly reduces damage by the boll weevil. In the more northern areas of cotton production, however, where often the cotton does not fully mature until near the time when frosts would kill the plants, and where the boll weevil enters a true state of hibernation as cold weather approaches, stalk destruction does not have the same effect in reducing the overwintering population, as in the more southern areas.

The research on sexually sterile screw-worm flies which has been under way for several years has already been mentioned. The successful eradication of this insect from the 170 square-mile island of Curacao in the Netherlands Antilles by releasing sterile males has stimulated interest in this unique method of insect control. An intensive program is now under way to find the most efficient and economical means of rearing the hundreds of millions of screw-worm flies that will be required if a similar eradication program is carried out in Florida.

On numerous occasions I have been asked whether this technique will be feasible for controlling other insects. In my opinion, the chances for success of the method are limited to a relatively few insects. It might be practical to control those species that disperse readily when released, and that can be reared economically and in large numbers under circumstances where the natural population is low or can first be reduced by other control measures. Currently we are conducting research on only one other type of insect to explore the feasibility of the sterile-male technique — that is on fruit flies at Hawaii. It is possible that we might find the method practical for eradicating incipient infestations of the type now existing in Florida.

Future Research Trends

THERE is little doubt in my mind that for years to come chemicals will be the most practical means of controlling most insects. However, I believe on the basis of our experience and certain new developments during the last 5 to 10 years that we will profit by emphasizing certain changes in our objectives.

Clearly indicated, in my opinion, is the need for better techniques to prove the usefulness of new insecticides. First of all, we should have more basic information on the mode of action of chemicals and the relationship between chemical structure and biological activity. This will apply whether we are seeking an insecticide, a repellent, or an attractant. Chemists with industry and other research groups have made excellent progress. The availability of large numbers of highly active chemicals amply supports this conclusion. Nevertheless, further progress in this direction is needed. We should know particularly what type of compounds will give maximum protection against insects with minimum toxicity to warmblooded animals. In view of the high cost of developing a chemical, it is also important that reliable but low-cost laboratory and small-plot test methods be developed, which will permit an accurate appraisal of its practical value. Costly and time-consuming field tests to establish biological effectiveness and the equally costly toxicological and residue studies should not be made unless there is reasonable assurance that the compound will have a place in insect control. It is essential also that adequate data to establish safety of a new compound be obtained at reasonable cost. This will require more attention to methods of assaying for residues and to basic research on disappearance of residues.

The problem of insects becoming resistant to insecticides must be resolved if chemicals are to be profitable to the manufacturer and satisfactory to the consuming public. This means continued basic and applied research on new types of chemicals, and on methods of employing them.

Another important problem that must be given more consideration is the effect of insecticides on parasites, predators, pollinators, and wildlife. Chemicals specific in action against the pest with minimum effect on the beneficial organisms must be developed. Much progress in avoiding adverse effects of pesticides might be made by studies on optimum dosage rates and correct timing of treatments.

Systemic insecticides offer unusual promise as a means of insect control, and in my opinion warrant more attention. The protection of plants, such as cotton, for several weeks or months during the critical seedling stage without serious danger of upsetting the balance of beneficial insects appears to be an excellent approach to chemical control. Many of our most serious insect problems involve young plants. If treatment is made on seeds or in the soil at the time of planting, it is likely that most of the residue will disappear by the time the crop is harvested. The potential for systemics is not limited to cotton. Their use may provide more effective and desirable insect control on many crops. Systemics for controlling livestock pests such as cattle

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*Presented at the Annual Meeting of the National Agricultural Chemicals Association, Spring Lake, N. J., Sept. 5, 1956.

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The old and new boards of the CACA. Seated: G. E. Willan, Niagara Brand Spray Co. Ltd., president elect; Ramsay Smith, C. A. Smith Ltd., retiring president; M. E. Ward, Du Pont Co. of Canada, vice-president; Arthur Carter, Green Cross Div., Sherwin-Williams of Canada, retiring director. Standing: J. H. Elliott, Rohm & Haas Co. of Canada Ltd., Assn. secretary; M. F. Anderson, Naugatuck Chemicals, retiring director; S. R. Stovel, North American Cyanamid Co., Ltd., treasurer; J. H. D. Ross, Chipman Chemicals Co. Ltd., director; D. D. Stokes, Monsanto Canada Ltd., a director; and W. H. Silversides, Interprovincial Cooperatives Ltd., a director.

Panel Discussion Cites Need for User Education at CACA Conference

THE fourth annual meeting and conference of the Canadian Agricultural Chemicals Association was held at the Sheraton Brock Hotel, Niagara Falls, Ontario, Canada, October 16-18, with approximately three hundred members and guests in attendance. G. E. Willan of Niagara Brand Spray Co., Burlington, Ont., was named president of the organization for the coming year, succeeding retiring president, R. G. Smith of Charles Albert Smith, Ltd., Toronto.

A. W. Hutchinson of Shell Oil Co. of Canada, Ltd., Toronto, is the new 1st vice-president, and M. E. Ward, DuPont Co. of Canada, Ltd., Montreal, the 2nd vice-president. J. H. Elliott, Rohm & Haas Co. of Canada Ltd., West Hill, Ont., was named secretary, and S. R. Stovel, North American Cyanamid Ltd., Toronto, treasurer.

A panel discussion at the October 18th session in which three farmers offered their views on how profitable it is to use agricultural chemicals was the high-light of the convention program. It seemed obvious from the comments of the various speakers that much still needs to be done in teaching the potential user of pesticides what is available to him in the way of agricultural chemical tools and how they can be employed most effectively by the farmer. Incidentally, the speakers seemed to be in general agreement that simplification and standardization would be welcomed by the consumer. The speakers suggested that there are too many trade names for the same chemical, which serves to confuse the farmer. Producers often use terms, they added, which only an expert would understand.

First speaker in the panel was W. C. Barrie of Galt, Ontario, who described how he has benefited on his particular farm from the use of agricultural chemicals. There is no crop that they grow on their 530 acre farm, the speaker said, that does not at some stage or other require the use of chemicals to produce it economically. In raising seed crops, he indicated, use of chemical sprays is particularly important. The weeds that predominate in his particular area are Canada thistle, ragweed, false flax, and lambs quarter. One application of 2,4-D at a rate of four ounces per acre successfully prevents most of the weeds from going to seed. When spraying grain crops that are seeded down, it is important, the speaker indicated not to exceed that concentration, and often even lighter dosages are applied.

The speaker recalled that years ago when formaldehyde was used to control smut there were times when it was not too effective, and there was always the risk of reducing germination if too much was used. Now, following the introduction of the newer type seed disinfectants, they never have a trace of stinking smut or bunt, and there is no danger of harming germination.

Mr. Barrie mentioned the use of cattle sprays to control flies on livestock, the use of aldrin to control brown heart and maggots on turnips, lindane to keep granary

President-elect G. E. Willan, Niagara Brand Spray Co., and retiring president R. G. Smith, C. A. Smith, Ltd

C. E. Willan, Niaara Brand Spray Co., Burlington, and J. V. Vernon, Niagara Chem. Div., Food Machinery & Chemical Corp., vice-president of the National Agricultural Chemicals Assn.

weevils under control and warfarin for rats. He reported that they employ pentachlorophenol to preserve fence posts and timber for pole barns, and sodium arsenate for killing off unwanted poplar trees.

The speaker reported that there are still occasional cases where trouble results from carelessness in spraying. The most common cause is where 2,4-D has been used for weed control and the farmer or custom sprayer then uses the same equipment without adequate cleaning to spray a growing crop, with unfortunate results.

W. Newman of Pickering, Ontario, gave a report on "Why I Don't Use More Agricultural Chemicals." He suggested that while the farmer specialists are taking advantage of agricultural chemicals, general farmers tend not to employ them in as great a quantity because of lack of knowledge of the chemicals and their specific uses. Often they do not know what may be available for a particular purpose or when or how to apply it to best advantage. He cited as a specific example a case where a farmer sprayed carrots to control weeds but made his spray application too late—after the weeds were about 4 inches high. The result was a poor kill. He tried a second time and for this spraying used a heavier concentration and an increased quantity. The result was that he burned up not only the weeds but also the carrot crop and lost considerable faith in the efficacy of chemical weed control materials.

The speaker deplored the fact that "there are not enough field men available to contact the average farmer and educate him in agricultural chemical lines." When application time comes around, the demands on the time of field men are often so great that they cannot follow up the farmers to whom they have sold chemicals with necessary advice on application. If the farmer could be shown how and when to spray his crops, the speaker suggested, he would be readier to tackle increased use of agricultural chemical aids.

Very little pasture land is sprayed in eastern Canada, the speaker reported, but if the farmer realized the increased number of cattle that can be carried per acre when pasture weeds are kept under control, it would not be long before many more farmers would be pasture spraying; and if the farmer would walk through his field and notice the innumerable insects and realize their detrimental effect on seed production, he could be more readily convinced that insecticides are efficient tools in increasing seed yield.

Lack of sufficient time and labor at critical periods in the growing season is another important factor in reducing farm consumption of agricultural chemicals. Cost of agricultural chemicals and lack of operating capital are other factors which tend to reduce the farmer's consumption below the optimum.

Finally, the speaker suggested that producers can help by standardizing their products and avoiding the present tendency toward using too many names for the same chemical. There is a need, too, he suggested, for producers to get their scientific data down to the farmer's level. He called also for more competent custom spray operators to provide skilled spray service and to help the farmer make more effective use of agricultural chemical aids.

W. A. Thomson of Pense, Saskatchewan, spoke on the same topic. He listed six reasons why agricultural chemicals are not employed more widely.

1. Many farmers are not too happy about the variety of somewhat conflicting recommendations they receive on the use of agricultural chemicals. They become confused and this limits their employment of agricultural chemical products.

2. He suggested that increased use of agricultural chemicals could be obtained if research men would meet more often to achieve desired uniformity of information and recommendations, instead of each individual research specialist giving his own results independently.

3. The agricultural chemical field is getting extremely complex. Advances are being made in the production of new chemicals for agriculture so fast that the work is getting far ahead of the ability of the extension specialist and the farmer to keep track of it. The result is that the farmer is becoming confused.

4. In the opinion of many agriculturalists appropriate and timely cultural practices will control weeds, both susceptible and resistant. Cultural control does not produce quite the same degree of control of such weeds as mustard and stink weed, but the farmer gets sufficient control of the more resistant weeds to keep them in check. The change to chemical control has resulted in the more resistant weeds getting out of hand and beginning to cause real trouble. Bind weed, buck wheat and dandelion, and wild oats have made serious headway on the Canadian praries in the past few years, and these weeds are now causing more concern than was ever caused by mustard and other more susceptible weeds. Perhaps, the speaker suggested, herbicides are becoming too selective.

5. Cost is a controlling factor in use of all types of agricultural chemicals.

6. There have unfortunately been too many cases of actual loss from the use of chemical applications in Canadian practice, — particularly in flax. The speaker cited a number of examples where use of agricultural chemicals definitely did not pay. In one case where a late seeded field was sprayed, the crop was a total loss, whereas, surrounding unsprayed fields were protected from early frost by high weed growth, making it possible to harvest a crop even though a dirty one. He suggested that it may be a mistake to spray fields that are neces-

sarily seeded late, and while he recognized that increased yields can be expected from the use of chemicals in years when there is no early frost or hail or other natural hazards, there are occasional situations where employment of agricultural chemicals can result in reduced yields.

Mr. Thomson closed his address with the following six point summary of recommendations and predictions:

1. I would not expect to see much change in the acreage of growing crops treated with herbicides until such time as the western farmer can feel a greater sense of security than he does at present. I would expect to see greater caution in the treatment of flax.

2. There is reason to expect that western farmers will use a great deal more chemicals for summerfallow control of the more resistant weeds. A reasonably priced chemical which will eradicate these weeds during the summerfallow year should be in demand. Farmers are not sufficiently aware of the possibilities, and an educational campaign is needed.

3. Farmers would respond immediately to the announcement of a chemical for the eradication of wild oats—provided the price is not prohibitive. The same enthusiastic reception would be assured for a product for the control of rust.

4. Extension aid is needed to encourage greater care in application of chemicals. There were many ineffective applications this year through carelessness.

5. Manufacturers would be well advised to keep the field of agricultural chemicals as simple as possible and to avoid making claims for a product that are not completely justified.

6. With the rapid progress being made in research and production, there is need for corresponding increase in extension activity.

DR. H. Martin, director of the Science Service Laboratory, Dept. of Agriculture, London, Ontario, delivered the major technical paper at the meeting on the subject "A Long Term Evaluation of the Place of Pesticides in Crop Protection." He observed that tremendous gaps still remain in our basic knowledge of the way in which pesticides function. With the exception of the organo phosphates, little certain is yet known of the reason why present day pesticides are biologically active. Even with a fungicide as simple chemically as sulphur, the reasons why this element should be so surprisingly toxic to the powdery mildews are scarcely known. Yet a present outstanding need is for a fungicide safer to the plant than sulphur or the dinitro derivatives such as karathane, to remedy the failure of captan and of glyodin against this group of fungi.

The speaker suggested that there are currently various hypotheses as to how pesticides kill insects. It is now thought that, to be insecticidal, the organo phosphate or a product of its degradation within the insect must be able to pass through the nerve sheath. Thus, in searching for new insecticidal anti-cholinesterases among the phosphates and carbamaates, it is well to avoid compounds capable of ionization. One such compound, diethyl B-diethyl aminoethyl phosphoro thiolate, has been introduced recently by International Chemical Industries under the name "Amiton" for acaricidal use. It is not surprising that this powerful systemic poison is not of much use against true insects.

Insect metamorphosis, the speaker observed, is now known to be hormone controlled, and much progress has been made toward isolation and identification of the responsible hormones. One, a crystalline hormone from silkworm pupae, contains an active principle of probable formula $C_{18}H_{30}O_4$. It is called Ecdysone. Similar products have been isolated from other insects and from a crustacean. Such hormones, when identi-

(*Continued on Page* 109)

Ralph Allen and Wayne Yoder, American Cyanamid Co., E. K. Hertel, Niagara, John Kennedy, Stauffer Chemical Co., Ray Barron, American Cyanamid, and (seated) S. H. Bear, Niagara.

A. E. Collazzo, Olin-Mathieson, J. W. Kennady, Diamond Alkali, Alfred Weed, Olin-Mathieson, John Stoddard, Prentiss Drug & Chem. Co., and R. F. Byrnes, Rohm & Haas.

L. G. Gemmell, Geigy, C. H. Jefferson, Pesticides Administrative Officer Canadian Dept. of Agriculture, George Hartz, Olin-Mathieson, T. W. Brasfield, Naugatuck, and Kenneth Nash, Olin-Mathieson.

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FERTILIZER
Views and News

By Vincent Sauchelli

N-P-K. in Fact

TRADITIONALLY, the fertilizer industry has labeled phosphorus and potassium nutrient elements in terms of their oxides, P_2O_5 and K_2O, respectively. Agronomists and other workers in agriculture have been using these same symbols, but in many instances in their writings and speeches have referred to them indiscriminately as phosphorus, phosphoric acid or phosphate and potassium or potash. Particularly with reference to phosphorus, the careless interchange of the various terms in the same article or talk creates confusion. Hence, it is good to know that the Association of American Fertilizer Control Officials (AAFCO) is initiating a change that will require reference to these nutrients as elements and not as oxides; that is, just as nitrogen (symbol N) is always referred to by that name and not as ammonia, we shall all be required to use the symbols P and K and not their oxides on labels, tags, bags, and so on and guarantees will be in terms of the elements.

Naturally, this means that industry and governmental agencies will have an educational job to do in acquainting the trade and farmers with the new nomenclature and the changes involved in formulations and ratios. If the phosphorus and potassium guarantees are changed, say in a 10-10-10 (N-P_2O_5-K_2O) fertilizer from the oxide to the elemental basis, the guarantee would read 10-4.3-8.3. This could be rounded off to read 10-4-8 to keep the ratio (5-2-4) and guarantee in round numbers. The fertilizer formulation would have to conform. In place of the ratio 1-1-1 before the change, a 2-1-2 ratio would be recommended after the change, both fertilizers having about the same nutrient content.

To put these proposed changes into effect, state fertilizer laws as well as the thinking of farmers, salesmen, dealers, and all the many others serving agriculture will have to be changed. All the laws should be changed as nearly as possible at the same time. This time should coincide with a reasonable period for educating people to the proposed changes. Accordingly, the AAFCO is proposing that the target date be 1960. All these changes and proposals were discussed at the October meeting of the Association in Washington, when endorsement of this change in nomenclature was requested from all the state official agencies and other groups directly affected. Industry opinion on this proposed change, naturally, varies as would be expected. The change will mean an additional cost. Some fear it will give traditional critics a chance to misrepresent: even now many persons who should know better say that a 5-10-10 fertilizer for example, contains 25% nutrients and 75% filler, most of which is sand. We know this is ridiculous, but do all those who listen to such critics know it? Apparently not. The proposed change, say its opponents, may make the educational job even more difficult and will not sell more fertilizer. The net result is problematical. It is my belief that most of these fears will not come to pass. In the long run the change will benefit all.

What Automation Is Not

HAVE you noticed how frequently the word "automation" appears in print and is bandied about by certain persons who seem to love the sound of it? The word was coined several years ago by Mr. D. S. Harder, a Ford Motor Co. employee, to describe a new, highly mechanized engine plant in which the equipment was very closely articulated so as to be operated automatically. Since then, the word has "caught on" and legion is the number of articles and tracts that have been avalanched on the public to describe the terrible implications of this novel philosophy of industry. So much so that "automation" has become a generalized, an omnibus word meaning all things to all men. What does the word really signify?

It is with some trepidation that I dare try to explain. Perhaps the best way to define it is by telling what it does not mean: when "automation" is used as a synonym for "mechanization" it is inappropriate; it does not imply the substitution of mechanical equipment for muscle. As I understand the term, the correct usage is to apply it to new *systems of control* and not to new sources of energy. It should describe the ability of automatic equipment to discriminate and sense, not simply to save muscle or reduce back-breaking, muscular effort. The nearest concept is conveyed by the implications residing in the new word "cybernetics" which derives from the Greek root meaning "to steer." The word cybernetics does not have the appeal nor easy lilt of automation and may never become popular. Yet, it is a good word and not hard to articulate once you get the hang of it. Why shouldn't it be used, if it correctly describes the thought? Of course, cybernetics is not a synonym for "automation," it is mentioned merely to point out the close kinship of the words, and to help get a better understanding of

the inherent meaning of automation. I sort of wince when I read or hear of "automation" on the farm or in the fertilizer factory, when all that is meant is that the farmer is using a tractor instead of a team of mules to pull the plow or corn picker, and the factory man is substituting a pay-loader for the hand truck.

Nitrogen and Clovers in New Zealand

NEW Zealand has 18,000,000 acres of grasslands, and has been using annually about 1,000,000 tons of phosphates to fertilize about 8,000,000 acres of these grasslands. Its pastoral farming has been based on a grass and clover sward, the clovers providing nitrogen fixed from the atmosphere, while the phosphates were applied primarily to encourage the legume. Up until now this system has worked well.

Recent investigations in that Dominion, however, are raising questions regarding the adequacy of the clover to provide the nitrogen requirements, particularly on farms that are intensifying their practices or are beginning to diversify their crops.

Reports from New Zealand indicate also that some attention must be given to potash requirements. The last year of record showed a consumption of only about 30,000 tons of muriate of potash all of which, like the phosphates, has to be imported since neither New Zealand nor Australia has any commercial sources within its own boundaries. Experience in the Dominion is proving what other countries long ago learned with respect to land productivity, namely, that constant cropping without replenishment of the plant nutrients removed leads to depletion and deficiencies reflected in lower quality and yields. Fertilizing with phosphates exclusively is not a sound policy. Sooner or later, depending on the original level of soil fertility, the phosphates will have to be balanced with nitrogen, potash and some or all of the other essential nutrient elements. Our own Corn Belt farmers learned this after about a century of cropping the virgin land without replenishment of plant food. Intensive farming induced by hybrid corn required the use of commercial fertilizers to get the extra potential yields from the improved strains of corn. At first, these farmers stressed nitrogen fertilization, but within a five-year period it was realized that the nitrogen had to be balanced with phosphate and potash if maximal returns were to be realized.

Balanced nutrition pays off whether for plants, livestock or humans.

Fertilizer Elements and Health: Copper, Potassium, Zinc, Magnesium

EVIDENCE keeps accumulating which emphasizes the very important function of certain chemical elements, either in maintaining the health and vigor of plants, animals and humans, or in causing diseases. The relationships between intensively-cultivated food crops and forages and health are not easily demonstrated; in fact, they are among the most difficult to study. Some persons such as the organic-fertilizer cultists do not hesitate to pontificate on the subject, but since they usually have no scientific data to support their observations, their views cannot be taken seriously.

These comments are prompted by several recent reports in the scientific press. New Zealand and South African reports are concerned with the effects of copper; that from Germany deals with grass tetany and disproves the allegation that excessive potash is the cause. The New Zealand story shows that copper deficiency in tobacco soils caused a leaf-breakdown disease, which originally was wrongly attributed to fertilizer nitrogen. The South African report deals with the influence of copper on crimping wool: if sheep do not get enough copper in their diet their wool grows straight. The market does not want straight wool. Applying copper sulfate to the grazing land corrects the condition.

This raises the interesting question: is that beautiful crop of naturally wavy hair one admires so much in men and women due to a better utilization of copper in their metabolism? *Quien sabe?*

The story of grass tetany has created much interest among European fertilizer personnel, primarily because the research of the German scientists disposed effectively of the allegation that this disease, common among dairy cattle, was caused by excessive potash fertilization of grassland. They showed that the cattle body cannot store potash in excess of its needs, and therefore a toxic amount could not be built up. According to the report, the cattle usually affected are cows giving a high yield of milk and having an unstable nervous system. Since only some cows in a herd become affected, the causative factor must lie in the body and not in the forage. The investigators suggest that the incidence of grass tetany depends on the effects of shock upon highly-strung cows in trying to adapt themselves to the sudden change associated with a fresh grazing site.

Another item in this category concerns the incidence of a non-specific skin irritation among pigs and technically known as parakeratosis. The addition of zinc to the diet apparently corrects the condition, according to some of the experts. Others contend the condition is induced by an excess of calcium in the diet. More research is indicated.

A serious cause of grass tetany in ewes, technically known as "hypomagnesaemia," was reported recently in an English veterinary journal. Apparently this condition is traceable to "magnesium deficiency" in the grassland. The development of this disease, whose name literally means low level of magnesium in the blood, was sudden and fatal. The flock of ewes affected was grazing a 4-year old pasture when it was stricken. Application of a fertilizer having a generous amount of soluble magnesia or dressings with a ton per acre of dolomitic limestone should correct the condition, according to those competent to judge.

These few examples of the influence of trace and major plant nutrients on health emphasize the high degree of responsibility which is shared in all communities by the fer-

(*Continued on Page* 123)

LISTENING *Post*

Test of Fungicides for Control of Mildew Disease of Mushrooms

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Epidemics and Identification Section, Horticultural Crops Research Branch, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

B. B. Stoller, R. E. West, and J. F. Bailey, of the Research Laboratory, West Foods of California, Soquel, California, report results of laboratory evaluation tests for fungicides to control the mildew disease, caused by the fungus *Dactylium dendroides*, of cultivated mushrooms. Laboratory results compared favorably with results from field tests, especially for eliminating ineffective chemicals. Of the 32 chemicals tested, Terraclor was found to be most satisfactory.

Mushrooms inoculated with the mildew fungus were incubated until the pathogen had made good initial growth, then sprayed with the test compounds at various concentrations and incubated again. After 48 and 72 hours they were examined for regrowth of the mildew fungus. Results are shown in Table 1.

Terraclor and Dowicide A inhibited mildew growth at 50 ppm, a lower concentration than any other test compound. Several of the nitro and chloro derivatives of benzene and phenol, which are structurally similar to Terraclor, were also inhibitory, but at a higher concentration. Pentachlorophenol, commonly used in one form or another to spray bed boards and as a general disinfectant around mushroom houses, was only mildly inhibitory when dissolved in the usual tap water.

The dithiocarbamates, used widely for spraying and dusting mushroom beds, were comparatively ineffective against the mildew. Vapam, however, was highly inhibitory, which would suggest that the decomposition products of this group are severely toxic to the mildew fungus, but that other dithiocarbamate compounds, such as zineb or nabam, are insufficiently decomposed by or in the presence of the mildew to be toxic to it at low concentrations. The rapid volatilization of poisonous vapors when Vapam is diluted with water prevents its application on mushroom beds, however, it is being used in place of formaldehyde, chloropicrin, etc. to fumigate the casing soil before casing the beds.

It was thought at first that the volatilization of ammonia was one of the important mechanisms for the inhibiting effects exhibited by chemicals with a nitrogen group, especially since volatile ammonia was initially observed with Terraclor. In later tests, however, volatile ammonia was detected after spraying with chemicals that were not inhibitory.

Of note in Table 1 is the fact that urea was inhibitory at 5000 ppm, but not at higher or lower concentrations. At 5000 ppm, volatile ammonia was strongly detectable, whereas slight, if any, ammonia was found at the other concentrations. Possible explanations might be that at 5000 ppm a suitable substrate for microorganisms, or the tissue of the mildew fungus or of its mushroom host, contained an enzyme capable of decomposing urea at this concentration. The obvious explanation for the inhibitory effect of methenamine is that the acid reaction of the mushroom or of *Dactylium* tissue induced the decomposition of methenamine into ammonia and formaldehyde.

The antibiotics tested were found non-inhibitory at an economic level. Plant growth substances were not inhibitory at the usual low concentrations in which these substances exhibit their hormone-like effect. Of the other chemicals studied, it was disconcerting to find that the copper salts of hydrazine and quinol were relatively ineffective. Many of the chemicals employed by mushroom growers as disinfectants, such as pentachlorophenol, nabam, zineb, Elgetol, copper salts, hypochlorite, and Roccal, were all relatively ineffective against the mildew.

In the initial phase of this investigation when no satisfactory control was available, considerable mildew was present on the mushroom beds. Accordingly, corresponding tests with some of the chemicals were made by spraying spots of *Dactylium* on the beds. The chemicals tested were zineb, nabam, chlorine, ammonia, Terramycin, Actidione, Dowicide A, and Terraclor.

When spots of the mildew on the beds were dusted heavily with zineb, or sprayed with the highest concentrations of zineb or nabam as shown in Table 1, the mildew mycelium usually regrew within 48 to 96 hours. When mildew spots were dusted with a powder containing 15% calcium hypochlorite, the mildew grew right through the dusted area. In the laboratory tests, 14000 ppm of available chlorine did not inhibit the growth of *Dactylium*, even though the chlorine was volatilizing in the bottom of the container and surrounding the tissue with chlorine vapor (as detected by odor). At 14000 ppm, growth of the mildew mycelium was more oppressed and slower than at half this concentration.

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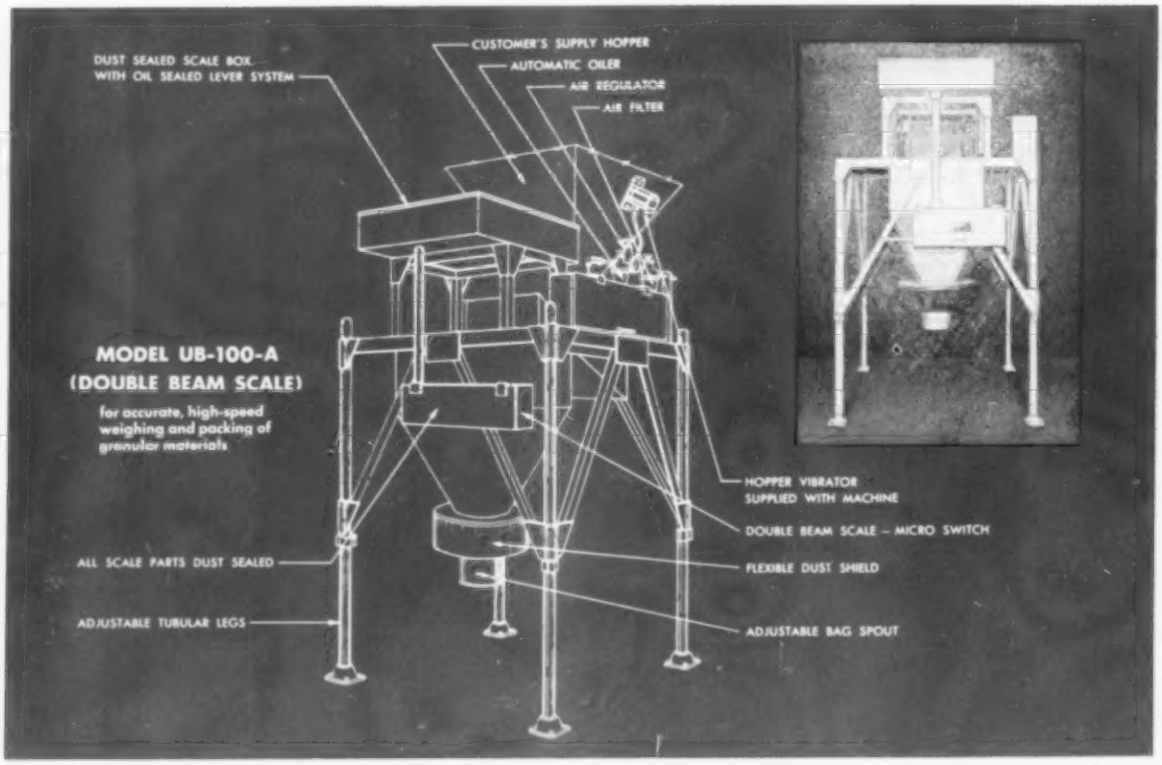

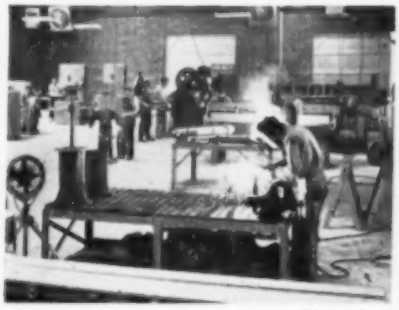

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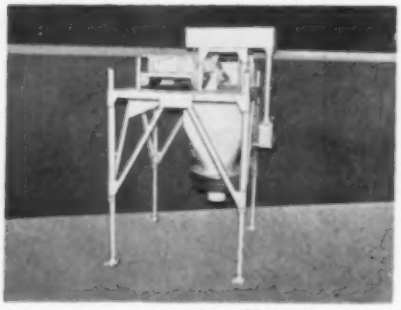

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C. L. Durham
Plant Superintendent
Dixie Guano Co., Laurinburg, N. C.

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Dixie Guano's I & C installation has given the company's Laurinburg, N. C., plant an average production rate of 16 to 17 100-lb. Multiwalls per minute. "That's as fast as a man can get bags under the spout," says Mr. Durham.

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These results confirm the ineffectiveness of chlorine against *Dactylium*.

Spots sprayed with a 1% solution (10000 ppm) of ammonia water usually remained clear of *Dactylium* for 7 days or longer. Sometimes new spots of mildew were found a few inches from spots sprayed with ammonia. Possibly the spores blown away by the pressure of the spray germinated later. Besides not being consistently inhibitory, when ammonia was sprayed on the beds, its odor filled the whole house and made the room uncomfortable for the pickers.

Growth of *Dactylium* on the mushroom beds was not prevented by spraying with 100 ppm of Terramycin; even at this concentration this is not an economical fungicide. Acti-dione sprayed on the beds was relatively effective at 200 ppm, but the number of tests was insufficient to draw conclusions. However, considering toxicity and cost, Terraclor is preferable.

Although both Terraclor and Dowicide A were inhibitory at 50 ppm in the laboratory tests, concentrations ten times as great were required to eradicate the pathogen established on the mushroom beds. This is understandable because the mildew mycelium is below the surface of the casing soil, so that the fungicidal sprays do not reach all parts of the tissue as in the laboratory tests. Spray solutions of 500 to 1000 ppm of Terraclor inhibited the recurrence and spread of the mildew for 5 weeks or longer. Dowicide A inhibited the regrowth of the *Dactylium* for only about 10 days. Terraclor either possesses a greater residual value or is more toxic to the spores of *Dactylium* than Dowicide A.

In this sampling of fungicides in the field, fungicides found ineffective in the laboratory were also non-inhibitory in the field. But for fungicides that were effective in the laboratory tests, supplementary tests on the mushroom beds are necessary in order to select the best fungicide for practical use.

Experiments with Terraclor were

(*Continued on Page* 115)

Table 1. Effect of various chemicals on growth of mycelium of Dactylium causing mushroom mildew

Trade name	Active ingredient	Growth[a] of mycelium at indicated concentration (parts per million)[b]									
		10000	5000	4000	2000	1000	500	200	100	50	25
NITRO AND/OR CHLORO BENZENES & PHENOLS											
Terraclor	Pentachloronitrobenzene			—	—	—		—	—	—	+
Dowicide A	O-Phenylphenol, Na Salt	—	—			—	—		—	—	+
Dowicide G	Pentachlorophenol, Na Salt	—	—			+					
Dowicide G, in distilled water		—	—			—					
———	Cresylic acid										
Pittsburgh B-622	2,4-dichloro-6-(O-Chloroanilino) S-Triazine			+	+		+		+		
SULPHUR COMPOUNDS											
Vancide 51	Na dimethyldithiocarbamate & Na 2-mercaptobenzothiazole			0	+	+					
Vapam	Na N-methyl dithiocarbamate					—	—	—		+	
AMMONIATING COMPOUNDS											
———	Ammonium hydroxide	—				+			+		
———	Urea	+	—		+	+					
———	Methenamine					—		+		+	
———	Dimethylamine			—		+			+		
ANTIBIOTICS											
Acti-dione	Cycloheximide							—	+	+	
Fradicin	———							+	+	+	
Terramycin	———								+	+	+
PLANT GROWTH SUBSTANCES											
2,4D	2,4-dichlorophenoxy acetic acid					—	+		+		+
———	A-naphthalene acetic acid, Na salt					+		+		+	+
———	Maleic hydrazide, Na salt					—	—		+		
MISCELLANEOUS CHEMICALS											
Omazene	Copper dihydrazin sulfate				+	+	+				
Stauffer N-1045	———					+	+				
Perchloron	Calcium hypochlorite	+	+		+	+					
Cunilate #2472	Copper-8-quinolinolate (soluble)				—	+	+	+		+	
Roccal	Alkyl-dimethyl-benzyl-nh$_4$cl	0	+		+	0	+		+		
BTC	Alkyl-dimethyl-benzyl-nh$_4$cl		+			0	+		+		
Isothan Q-15	Lauryl isoquinolinium bromide				—		—	+			
———	Formaldehyde	—	—			0	+				

[a]Symbols: + = regrowth of Dactylium mycelium; — = no growth; 0 = variable.
[b]Concentration calculated on active ingredients.

Spotted Alfalfa Continues Rampage, Truck Crop Pests Active

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head — Plant Pest Survey Section, Plant Pest Control Branch, U. S. Department of Agriculture. His observations are based on latest reports from collaborators in the U.S.D.A.'s pest surveys throughout the U. S.

By Kelvin Dorward

Spotted Alfalfa Aphid Spreads

THE spotted alfalfa aphid which, in the last report on the pest in this magazine, had just been found in North and South Carolina and Virginia, continues to spread. Within recent weeks, surveys conducted cooperatively and individually by personnel of the Cereal and Forage Insects Section of the Entomology Research Branch, Agricultural Research Service, cooperative survey entomologists and other interested state and federal workers have found the aphid in several additional states. Following the finds in the Carolinas and Virginia, the aphid was found in Tennessee, South Dakota, Iowa, Minnesota and West Virginia.

As of January 1, 1956, the known distribution of the aphid in this country was 14 states west of the Mississippi and south of a line from Iowa to the state of Washington, excluding Idaho where one county was found infested late in 1955. States east of the Mississippi now known to be infested include Mississippi, Tennessee, Kentucky, Illinois, Florida, Georgia, South Carolina, North Carolina, Virginia and West Virginia.

In the newer infested states, recent reports show the spotted alfalfa aphid to be distributed rather widely in Tennessee, North and South Carolina, Virginia, the southwestern part of Illinois, southwestern Minnesota, eastern South Dakota and western and southern Iowa. In West Virginia, confirmed specimens have been submitted from one county and unconfirmed specimens from one county.

The behavior of the aphid east of the Mississippi is being watched very closely. Although isolated reports of economic damage have been received from this area, the populations generally have remained low. How the pest behaves when it becomes firmly established is of concern to agricultural workers. In some states where the pest was previously established, there has been a definite build-up within recent weeks. Populations in the Salt River Valley of Maricopa county, Arizona, were much higher early in October than during the same period last year. Heavier populations were found also in Cochise and Graham counties of that state. Build-ups were reported in Nevada, where the aphid has now been taken in Washoe county, which is in the northwestern corner of the state. Damage has been recorded as far north as Salt Lake county, Utah, and heavy populations reported from Colorado. Populations of up to 14,000 per 100 sweeps were recorded from Otero and Pueblo counties, Colorado, and up to 15,000 from Kit Carson county. Populations of over 1,000 per sweep were reported from areas of the Republican Valley in Nebraska. Drought and the spotted alfalfa aphid were responsible for damage to alfalfa in parts of Kansas and Missouri. Northwestern Louisiana reported severe damage in Bossier Parish. It is worthy to note that in Oklahoma, where damage was so severe in the spring of this year that populations have remained at a rather low level this fall.

Important Truck Crop Insect Activity

ONION maggot has caused the most severe damage to onions in Walla Walla, Washington, area in the history of the onion industry in that state. In late September, this pest was still abundant in southwestern Idaho where it was causing heavy damage. Serious infestations causing an estimated loss of 10 per cent of crop have been reported also in Malheur county, Oregon. Infestations of potato tuberworm ranging from slight to severe, were discovered in four counties in Utah in early October. The most severe infestations of this serious pest of potatoes were found in Washington and Iron counties, with very light populations in Millard and Beaver counties. Cabbage looper was causing concern in several areas in October. Louisiana reported heavy populations in cole crops in several parishes; Texas had medium to heavy populations in Zavala county on cabbage, cauliflower and pole beans; while the pest was rated the most troublesome insect on cole crops in the eastern Virginia area. Heavy hatching of larvae was noted in tomato and lettuce fields in Imperial Valley of California, and egg-laying activity was heavy in lettuce fields in Dona Ana county, New Mexico, but the pest was under control in most fields in this county. Damage to young lettuce plants has been especially heavy at Yuma, Arizona, where up to 30 eggs per plant have been found. Weekly applications of insecticides were not controlling adequately the infestations in some cases in this area. The looper was also unusually abundant throughout Maricopa county.

Meadow Spittlebug Outlook in Illinois and Ohio

FALL survey for meadow spittlebug in Illinois showed heaviest infestations, up to 12 adults per sweep, in northern counties. East central counties showed as many as 5.4 spittlebugs per sweep. Highest counts in Ohio were in the northeast, 2.14 adults per sweep, and east central area, 2.05 per sweep. The pattern of infestation remained about same as 1955 in this state, although the general level of infestation increased in every area except the southwest, where it remained about the same as last year. In the spring of 1957, infestations of spittlebug nymphs on Ohio legumes are

(*Continued on Page* 111)

WASHINGTON *Report*

by
Donald G. Lerch
Cornwell, Inc., Washington, D. C.
(Agricultural Chemicals Washington Correspondent)

BIG surprise during the latest meeting of the NAC Foreign Trade Committee was the extent of interest in pesticides shown by the half dozen or so visitors from Central and South America and the Philippines who were guests of honor at a reception at the Congressional Hotel.

Speaking for the Association, Lea S. Hitchner, Executive Secretary, told the visitors "the fundamental problem for all of us in industry, in government, in education, is to carry information about the pesticides to those who can use it." Overseas guests included key figures in agricultural communications from Brazil, Nicaragua, Paraguay, Peru, Jamaica, and the Philippines.

Mr. Hitchner continued, "Through press, radio, and television, and other communciation channels, information about industry is carried directly to the farmer's living room—no communications medium is left idle."

The group was welcomed by Peter Joyce, chairman of the Foreign Trade Committee, who used not only the English language, but presented special recordings in both Spanish and Portuguese, making quite a hit with the guests. Brief remarks were made by Miss Roberta Clark, U. S. Department of Agriculture, Dana Reynolds, and Helen Lortz, International Cooperation Administration, and the writer.

The presentation stimulated continuing discussion on quite a wide array of subjects connected with pesticides. Of chief concern to the visitors was the apparent lack of detailed and continuing information on pest control chemicals. It was observed that these people, being in the information rather than the technical field, are not among the first contacted with industry's story. It was the feeling of some that more information should be directed to those who have the eyes and ears of the buying and using public.

To this end it was reported that a directory of those in the agricultural communications field in Latin America was being compiled, and it was hoped that information would be completed for one or more countries by the middle of next year. This would supplement existing information about agricultural communications now in the hands of advertising agencies and most agricultural chemical companies.

The visitors are scheduled to remain in the United States for eleven weeks, returning home about the middle of December. Most of them will visit New York and Chicago before their return to Washington.

Technical leader is Dave O. Thompson, former director of information for the Grocery Manufacturers of America, and one of the leading agricultural information men in the United States.

Names of the foreign visitors are listed at the end of this column.

* * * * *

The National Plant Food Institute will oppose the request by the railroads for 15% freight rate increase. Final date for filing written statements of opposition is December 14, with cross-examinations scheduled for January 15, and oral arguments January 22.

Essentially the railroad case is based upon the argument that the returns are not sufficient to pay a reasonable rate on invested capital. However, examination of available data shows that the return on capital invested in the fertilizer industry is less than the return received by the average railroad. This should be a most important argument favoring the position taken by the National Plant Food Institute.

Freight rate negotiations are often long and drawn out, and exhausting. It seems likely that the NPFI's Paul Truitt, Executive Vice President, has a major challenge on his hands and one of great importance to the fertilizer industry and to farmers. The outcome of this matter will have a great effect on fertilizer industry profits and probably on fertilizer consumption by farmers.

* * * * *

Two worms in a tin can. Get ready to blink, because the old Tom Sawyer approach to fishing now adds up to a two billion dollar a year business! America's most popular form of outdoor recreation is sport fishing according to the first survey of its kind ever made by Crossley S-D Surveys, Inc. for the U. S. Fish and Wildlife Service. It shows that about 21 million people fished regularly last year, with the average angler spending about $82.00 each year on the needs of this sport. Sixty-two percent of all anglers were men, 23% women, and the remaining 15% were minors under 18 years of age. One out of every four households has one or more fishermen in it.

Furthermore according to the Sports Fishing Institute, the total capital assets of all corporations manufacturing chemicals and allied products amounts to a little more than one-third the equivalent minimum capital worth of sport fisheries. The capital value of the sport fishery resource is rated at 50 billion dollars, and ranks among the very highest figures credited to the major groupings of industries listed by the Securities and Exchange Commission

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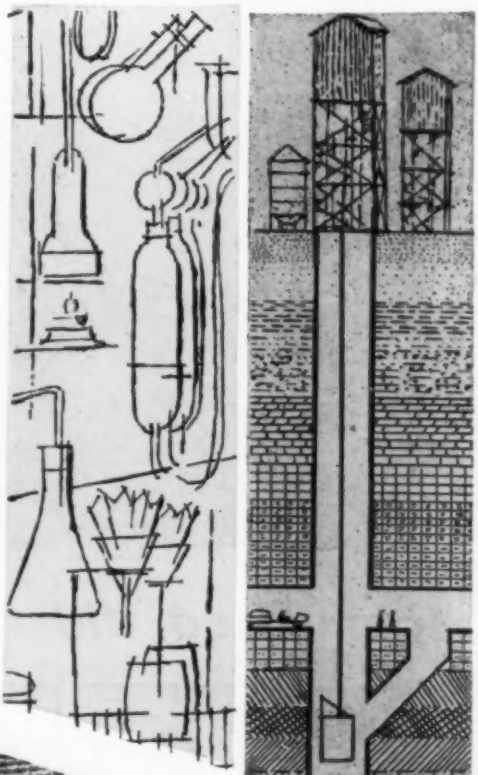

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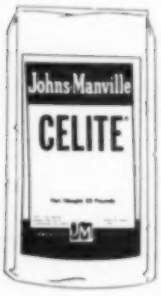

The ability of Celite* diatomaceous silica to absorb its weight in water or oil pays off for insecticide formulators in two ways. (1) Celite absorbs large quantities of liquid poisons while retaining the easy-to-handle properties of a dry dust. (2) Celite's powerful anti-caking action keeps dusts free-flowing and assures uniform poison dispersion in wettable powders prepared by final packagers.

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and the Federal Trade Commission in their four-quarter report.

One of the reasons why this report may be of special interest to both the pesticide and fertilizer industries is because of the benefits as well as hazards to fish and wildlife from using agricultural chemicals.

For instance reports on the advantages of fertilizing forest lands seem most encouraging and while this research is in its infancy, a great potential for fertilizer may be in the making. What's more, the proper use of herbicides kills off the undesirable plant growth and increases the amount of feed available for deer. Pest control chemicals protect forest lands and improve conditions for wildlife in general.

On the other hand the misuse or careless use of certain agricultural chemicals may limit the feed for wildlife and kill fish.

While the benefits far outweigh the hazards from a scientific point of view, there continues to be quite a bit of concern among sportsmen on the use of agricultural chemicals. The concern shows up in the form of letters received by Congressmen, and government agencies, including the Fish and Wildlife Service and the Department of Agriculture.

After talking to some of the people who answer these letters, it appears to the writer that the only answer many of them wish to receive is that the government believes the use of all agricultural chemicals should be stopped. This, of course, is an extreme view and one which the government does not hold. However, it illustrates the continuing concern over the use of agricultural chemicals by apparently small minorities.

Attacks on agricultural chemicals also result whenever large-scale pest control programs are launched. For instance, the continuing campaign against the Mediterranean Fruit Fly in Florida, which is proceeding satisfactorily according to most, is drawing its share of letters and protests from Florida people and people elsewhere who read and hear about the program. When these letters are received by Congressmen—they are then forwarded to the appropriate government agencies for answering.

One of the things that still seems to surprise some people is that most Congressmen do read their mail, and they are very sensitive to voluntary letters received from constituents.

Consequently, it would seem that while industry is busy learning to work under the new Miller Amendment, there is still need for a broad program of public education, perhaps more than is generally appreciated.

* * * * *

Government and industry will be participating in the November 15 meeting sponsored by the Agricultural Research Institute on agricultural chemical matters. The meeting is being called by W. C. Dutton, President of the Agricultural Research Institute, Lansing, Michigan. It is probable the meeting will be similar to the one held last year.

* * * * *

The concern of the fertilizer industry over the lime deficit shows up in the latest issue of the *Plant Food Review* published by the National Plant Food Institute. The special 16-page section titled "Why Don't Farmers Use Enough Lime?" is packed with convincing arguments and facts about the need for lime in sound land management and efficient farming.

There is a feeling that some of those in the lime business have depended too much on the government too long, and that there is no modern, aggressive merchandizing program to convince farmers to use more lime. In many cases the lime business is a side line and there does not seem to be any vigorous industry-wide program to develop business on the basis of the dollar and cent values lime returns to the farmer.

From the fertilizer manufacturers viewpoint, soils that are deficient in lime may not respond to the application of fertilizer, and the farmers therefore would not get full value on their investments.

Here's a case of where everybody's in favor of lime but not much is being done about it.

Washington visitors are finding W. B. Rankin installed and hard at work in his new post of Assistant to the Food and Drug Commissioner. Dr. Rankin, well known to industry, is handling general matters as assigned by the Food and Drug Commissioner.

Frank McFarland is now in Rankin's former position, that of Assistant to the Director, Bureau of Biological and Physical Science of the Food and Drug Administration.

* * * * *

Here is a list of overseas guests attending the Washington meeting of the Foreign Trade Committee of the National Agricultural Chemicals Association:

Wyatt Errington BRYCE, Assistant Secretary, Information of Publications, Jamaica Agricultural Society, Kingston, Jamaica.

Augusto CHAVEZ Costa, Chief, Agricultural Pages of "La Cronica", Lima, Peru.

Juan Antonio CUZZI, Managing Editor, "El Deber" daily newspaper, Arequipa, Peru.

Felix FERNANDEZ, Director of Publicity, Ministry of Agriculture, Asuncion, Paraguay.

Jose Rual PRADO Ruiz, Radio and Press Editor, Technical Agricultural Service, Nicaragua.

Benedicto RIBERIO, Economic Columnist for "Diarios Associados", San Paulo, Brazil.

Fernando de los RYES, Supervisor, Agricultural Information, Manila, Philippines.

Sebastiao Concalves da SILVA, Chief Press and Radio Agent for Secretary of Agriculture, San Paulo, Brazil.

Amarilio Castro SOUZA, Extension Assistant, Agricultural Information Service, Ministry of Agriculture, Rio de Janeiro, Brazil.

Uldarico Isaac TRIUMFANTE, Assistant Supervising Editor, Dept. of Agriculture Publications, Manila, Philippines.

Jose Anastasio VIEIRA, Agricultural Information Service, Brazil.

Maro VILHENA, Chief, Information Section, Federal Coffee Institute, Rio de Janeiro, Brazil.★★

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WSA Issues Call for Papers

The first call for papers for the 1958 meeting of the Weed Society of America Jan. 13-15, 1958 at the Peabody Hotel in Memphis, Tenn. was issued last month. The Society has announced that the title and three abstracts of each paper are due in the hands of sectional program chairmen on or before August 1, 1957.

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Technical SECTION

Possible Use of Sorbic Acid as a Preservative for Corn Silage

By D. K. Salunkhe
Utah State Agricultural College
Logan, Utah

MANY types of preservatives such as ground cereals, sugar beet pulp, and molasses are employed to preserve silage in the best possible condition. These preservatives are high in fermentable carbohydrates which help to stimulate lactic acid fermentation. Some farmers have been using hydrochloric and sulfuric acids to control the protein break-down which gives an unpleasant smell to silage. The use of ground cereals is uneconomical. Beet pulp and molasses are available only in certain locations and usually in limited supply. Inorganic acids like hydrochloric or sulfuric are strong acids, and from the viewpoint of farmers, they have been difficult to handle and distribute in the silo. Likewise, such acids produce deleterious effects on the digestive system of farm animals. Virtanen[4] reported that there is a need of a suitable and cheap organic acid which will mean progress in the future in silage making with acids.

In recent years sorbic acid, a mild organic acid, has been used extensively as a fungistatic agent in the food processing industries. In cucumber fermentation, 0.1 percent sorbic acid controlled yeast scum formation preventing interference with the normal and desired fermentation by bacteria which produce lactic acid (Phillips and Mundt[2]). It has also been shown that the sorbic acid is less toxic, and a better preservative than sodium benzoate (Deuel, Jr. et al.[1], and Salunkhe[3]).

This report discusses the effect of sorbic acid on the preservation of corn silage.

Wide mouth glass jars were used as the experimental silos. The corn silage was prepared in them as would have been in the regular silos. Prior to ensilage, corn plants were chopped into small pieces and were "pitched" in the "silos." Each layer was packed well. Water was sprinkled on the top of each layer in case of untreated (control) silos which were packed to remove the air pockets. In the case of treated silos, sorbic acid solutions were sprinkled instead of water. Concentrations of 0.3, 0.2, 0.1, 0.5, 0.025% of sorbic acid on an absolute weight basis were prepared in tap water, and were sprinkled on the top of each layer of the ensilage material. (Sorbic acid was furnished by the Carbide and Carbon Chemicals Company, New York.) Some of the silos thus prepared were covered with air-tight lids and the remaining were uncovered. The experiment was conducted in triplicate. Following ensilage and treatments, the silos were stored in cardboard boxes at room temperature for a period of five months. After five months, they were weighed to determine the per cent loss in weight and were opened to inspect the microbial growth on the surface.

It was noticed that sorbic acid treated silage was less affected by mold than untreated silage. Higher concentrations of sorbic acid were more effective to control the moldy growth than lower concentrations. However, a concentration 0.1% was as effective as the 0.3% application.

Figure 1 shows the profuse growth of mold on the top layer of the silo which was sprinkled with water, and Figure 2 shows very little or no growth on the top layer of the silo which was sprinkled with sorbic acid solution at the concentration of 0.1%. Moldy growth on the silage gives bad odor and flavor.

The occasional spraying of the silage material with harmless sorbic acid solution (0.1%) while the silo is being filled will preserve silage in good physical condition. At the same time the larger percentage of proteins will be preserved which ultimately will be recovered in milk and in meat. The pH of sorbic acid (0.1%) solution is 3.6. The preservation of the silage material at such low pH produces the silage of high quality.

Fig. 1. Growth of mold in profusion on the surface of silage sprinkled with water.

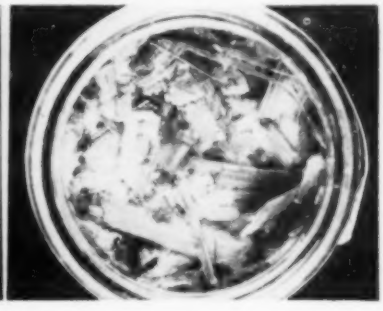

Fig. 2. Very slight growth of mold on the surface of silage sprinkled with sorbic acid (0.1%) solution.

Literature Cited

1. Deuel, Jr., H. J., Alfin-Slater, R., Weil, C. S., and Smith, Jr., H. F. *Food Research.* 19 (1): 1-12 (1954).
2. Phillips, G. F., and Mundt, J. O. *Food Technol.* 4 (7): 291-293 (1950).
3. Salunkhe, D. K. *Food Technol.* 9 (11): 590 (1955).
4. Virtanen, A. I. Proc. 6th. International Grassland Congress. 2: 1147-1152 (1952).

DDT for Tobacco Budworm

Dusting tobacco with DDT is still effective for control of the tobacco budworm, providing growers apply the dust properly, reported the USDA last month. A 10% DDT dust, applied directly to tobacco buds with a small plunger duster as soon as the young budworms appeared, gave excellent protection in tests conducted at Florence, S. C. The tests were made cooperatively by the USDA's Agricultural Research Service and the South Carolina Agricultural Experiment Station.

The dust checked depredations by the budworm even when plants were treated during a heavy wind and despite a 0.3-inch rainfall soon after the DDT was applied.

Some large-scale tobacco growers in the Southeast had recently used tractor and rotary-hand dusters to speed up the dusting operation, but extensive research at the Florence station showed that dusts applied to the tops of plants by this equipment did not give satifsactory budworm control. Poor control of the pest with tractor and rotary-hand dusters has caused some growers to suspect that the budworm had developed resistance to DDT, a theory which Florence researchers denied, stating that poor results were probably due to poor application methods.

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Clover Weevil Bulletin

A new six-page Farmers' Bulletin on the clover leaf weevil issued last month by the USDA, tells various effective control measures for this widespread pest of alfalfa, red clover, and white clover. USDA entomologists report that these crops are seldom lost entirely from weevil attacks, but point out they may be damaged seriously. Over most of the country, especially in areas of high humidity, a fungus disease keeps the weevil in check.

The new publication recommends practices that encourage this helpful fungus, and at the same time favor the growth of clover and alfalfa. The practices are: (1) keeping up fertility to encourage vigorous plant growth, (2) maintaining a good supply of humus in the soil for better retention of moisture, and (3) using alfalfa and clover regularly in mixtures with grass in crop rotations.

The fungus disease usually takes care of the problem. But sometimes in the fall, especially in the South, it may be desirable to spray with methoxychlor at the rate of 1 pound per acre. The bulletin describes how to use this insecticide effectively and safely.

"The Clover Leaf Weevil and Its Control" (FD No. 1484) may be obtained from the USDA, Wash., D. C.

•

Apple Pest Control

Selection of spray combinations for control of apple pests in Connecticut involves study of many insects and diseases, as well as color, flavor, and yields, which are affected indirectly by leaf damage. Best mixtures were those used in 1954, as indicated by results given in following tables:

Non-toxic combinations need more study in the Northeast to avoid excessive plum curculio and apple maggot damage and to avoid the numerous substitutions which became necessary with lead arsenate and chlorinated hydrocarbons. Study of these, however, should not be abandoned.

"Further Study of Spray Combinations for Control of Apple Pests in Connecticut," by Philip Garman, in *Journal of Economic Entomology*, Vol. 49, No. 4, August, 1956.

High Concentrates Urged

Use of concentrated fertilizers for application in both solid and liquid form is strongly urged in the spring edition of *Service*, a review of agricultural and chemical progress published in New Plymouth, New Zealand. Titled "High Nutrient Value of the Concentrated Fertilizers," the article points out that the prevalent use of phosphatic fertilizers in New Zealand has resulted in some potash deficiencies in long-farmed areas.

"New Zealand has no indigenous supply of the major plant nutrients, only one—nitrogen—being capable of local production. Unfortunately, at the time of writing, it is the major plant food in least demand, although its importance is bound to increase. Potassium salts have to be imported in a form ready for application; but, in the case of phosphate, the raw rock is mined at Nauru and Ocean Islands and brought to New Zealand."

Tests were conducted with JAX, a diammonium phosphate product of Monsanto Chemical Co. As some of the advantages of the product it lists: 1. more even distribution of the fertilizer, 2. possible foliar absorption, 3. dustless, clean operation, 4. can be applied to a definite time schedule, 5. will be combined with weedkillers of the hormone type to check weeds while feeding the pasture plants, and 6. can be combined in liquid form with most soluble fertilizer.

Percentage of apples free of external insect and disease blemishes, 1954:

	McIntosh	
	Windfall	Picked
Methoxychlor-TDE-captan-malathion	95.8	94.1
Methoxychlor-TDE-captan-glyodin	93.8	94.2
Lead arsenate-captan-malathion	93.4	87.0
Ryania-glyodin-(malathion to calyx)	80.5	80.9
Parathion-nabam-ferric sulfate	72.0	64.0
DDT-parathion-glyodin	89.4	84.6

Percentage of apples free of external insect and disease blemishes, 1955:

	McIntosh	
	Drops	Harvested
Methoxychlor-captan	90.3	96.2
Dieldrin-lead arsenate-captan	93.5	64.8
DDT-parathion-captan-glyodin	81.4	83.2
Methoxychlor-malathion	76.9	78.8
Ryania-captan-glyodin	72.0	50.8
Lead arsenate-captan	59.5	76.9
Diazinon-captan-glyodin	38.1	31.9

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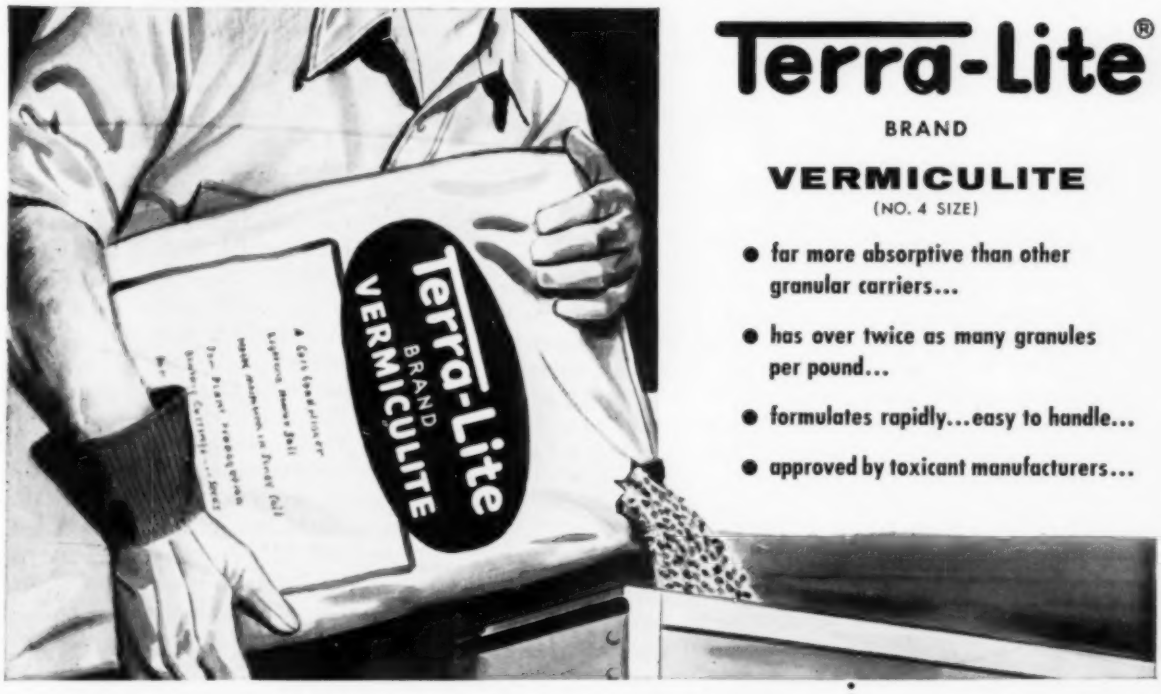

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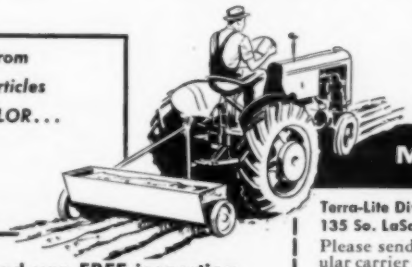

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Heptachlor for Medfly

The Mediterranean fruit fly is one of the worse, if not the worst, pest of fruit in tropical and substropical countries.

Most of the common organic insecticides have been used by various workers against the Mediterranean fruit fly with varied results.

The possibility of disruption of the natural equilibrium between harmful insect and their parasites by conventional use of organic insecticides is largely prevented by a soil treatment to control by contact the larvae, papae, and adults.

Preliminary tests in pots using 300-400 grams of 25 percent emulsifiable concentrate of technical heptachlor diluted with 100 litres of water and 6 percent dust of technical heptachlor at 30-35 kilograms per hectare showed promise against pupae. Further tests in pots with larvae and pupae gave mortalities from 75 to 100 percent with dust treatment and 60 to 85 percent control with emulsions. Larval mortality was higher than pupal.

Complete larval mortality resulted where the heptachlor had been mixed with the soil.

"Control of Larvae and Pupae of the Mediterranean Fruit Fly in the Soil with Synthesized Organic Products, Particularly Heptachlor," presented by Dott. Giorgio Costantino, Italy, at the International Congress of Entomology, August 17-25, Montreal, Canada.

•

Chlorinated Phosphate Study

Five closely related chlorinated phosphates, all esters of 1,2,2,2-tetrachloroethyl phosphoric acid, were tested for cholinesterase inhibition and relative toxicity to the house fly. The diethyl, dipropyl, diisopropyl, and dibutyl esters were 0.75, 0.36, 0.18, and 0.26 as toxic as the methyl ester when tested against an insecticide-susceptible strain. Generally, toxicity decreased with the increase in the length of the carbon chain of the alkyl group.

All the materials were inhibitors of bovine red-blood-cell cholinesterase. No definite relationship between chemical structure and cholinesterase inhibition was shown.

"The Relative Toxicity and Mode of Action of Some Chlorinated Phosphates," by Norman Mitlin, Frank H. Babers, and W. F. Barthel, in the *Journal of Economic Entomology*, Vol. 49, No. 4, August, 1956.

•

Seed Dressings Studied

Results of extensive trials indicate that the newer materials, aldrin and dieldrin, are in general appreciably less efficient than gamma-BHC for the control of wireworm, wheat bulb fly (in late winter drillings), flea beetle, and carrot fly. On the other hand, they may possibly show greater residual action against wheat bulb fly or spring wireworm attack when applied to early autumn drillings. On wheat and barley, they are less phytotoxic than gamma-BHC, but the reverse is probably true on oats.

The only recent development in application has been the somewhat tardy introduction of a 1 oz. per bushel application rate on cereals.

The control of certain pests, such as wireworm and flea beetle, has been reduced to the same level of ease and simplicity as that of seed-borne diseases, and almost to the same low level of cost. Gamma-BHC is bridging the gap between the systemically inactive insecticides, which are now appearing in dual-purpose dressings, and the systemically highly active materials which will almost certainly hold the field in the future. This systemic property must also extend to the mercurial component if such diseases as the loose smuts and the foot rots are to be controlled properly.

In the future, therefore, one must look more and more to the systemic fungicides and insecticides as the active ingredients of the new, more concentrated, dual-purpose seed dressings.

Some Recent Developments in the Use and Application of Dual-Purpose Seed Dressings, by D. Price Jones, *Journal of the Science of Food and Agriculture* (London), Vol. 7, 1956, Suppl. Issue.

Control of Fruit Flies

Numerous highly toxic phosphatic and chlorinated hydrocarbon insecticides and formulations with demonstrated or strong potential usefulness for controlling or eradicating tropical fruit flies in many parts of the world have been developed during the past decade. New bait sprays in which comparatively small amounts of protein hydrolysate and phosphatic insecticide are applied have been especially effective in protecting ripening or ripe fruits from attack by the oriental fruit fly (*Dacus dorsalis Hendel*). They are also effective against other species including the Mediterranean fruit fly (*Ceratitis capitata* Weid), the melon fly (*D. cucurbitae* Coq.), and the Mexican fruit fly (*Anastrepha ludens* (Loew)). The protein hydrolysate bait contains nutrients essential for the sexual development of the oriental fruit fly. Applications of demeton, a systemic insecticide, may prevent oriental fruit fly development in guavas for an entire crop. Reduction in infestations of the oriental fruit fly brought about through male annihilation with poisoned methyl eugenol feeding stations suggests the usefulness of this method as an eradication tool in situations where it can be applied to entire populations. The sterile male release method also has promise for application to fruit fly problems. Control of infestations in fresh fruits and vegetables for quarantine purposes has been improved by ethylene dibromide fumigation and modifications of the vapor-heat sterilization method. Aqueous dips containing ethylene dibromide or other toxicants are also highly effective in destroying infestations in fresh fruits and vegetables, while ionizing irradiation from a cobalt 60 source has exciting possibilities because of a delayed lethal effect that prevents development of exposed immature stages beyond the pupal stage.

"Recent Progress in the Development of Procedures for Eradicating or Controlling Tropical Fruit Flies," presented by L. D. Christenson, Washington, D. C., at the International Congress of Entomology.

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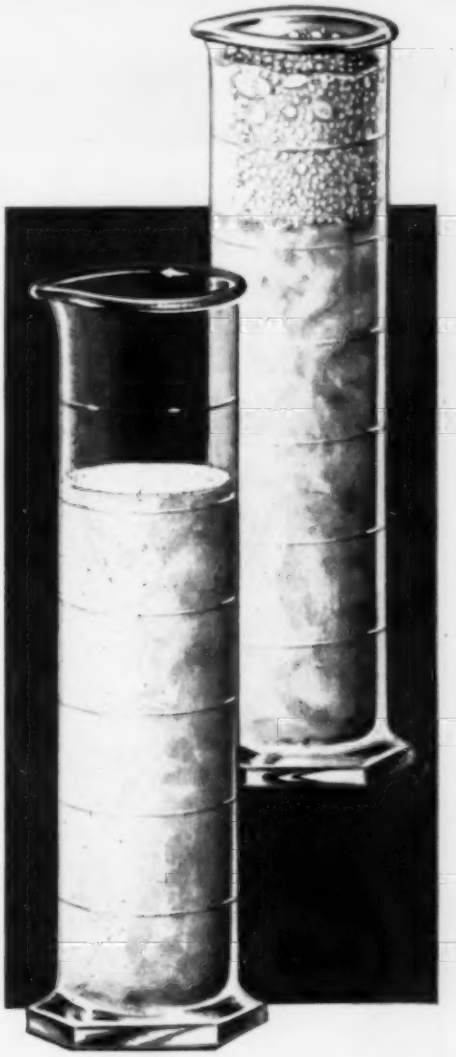

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In Canada: Chemical Developments of Canada Ltd., 420 Lagauchetiere Street W., Montreal 1, Quebec

INDUSTRY *Patents*

The data listed below is only a brief review of recent patents pertinent to the readers and subscribers of this publication.

Complete copies of these patents may be obtained by writing to the publisher of this magazine and remitting 50¢ for each copy desired. For orders received outside of the United States the cost will be $1.00 per copy.

2,741,876. SOIL CONDITIONER AND METHOD OF MAKING SAME. Patent issued April 17, 1956 to Carlo Paoloni, Turin, Italy, assignor to Rumianca S.p.A., Turin, Italy.

The method of rendering arable a normally non-arabic acidic agrillaceous soil which comprises mixing with said argillaceous soil a soil conditioner comprising a granular conglomerate consisting essentially of 5 to 90% by weight of a member of the group consisting of iron oxide and iron hydroxide and 10 to 95% by weight ferric sulphate, said soil conditioner being employed in the proportion of ½ to 2 tons per acre of soil.

2,744,818 LOW VOLATILE HERBICIDAL COMPOSITIONS. Patent issued May 8, 1956 to William R. Davie, Pittsburgh, Pa., assignor to Pittsburgh Coke & Chemical Co., Pittsburgh, Pa. As a new herbicidal mixture of esters, the mixture of esters having the formula

$$Ar\text{—}o\text{—}\underset{|}{CH}\text{—}COOCH_2R$$

where Ar is an aryl group selected from the group consisting of phenyl, 2-methylphenyl, beta naphthyl and the aryl nucleus chlorinated derivatives thereof and R is a mixture of alkyl radicals containing substantial amounts of each of normal, saturated C_6, C_7 and C_8 groups and the 2-methyl isomers thereof.

2,745,729 HERBICIDAL COMPOSITION. Patent issued May 15, 1956 to David T. Mowry, Kirkwood, Mo., and Arthur H. Schlesinger, Dayton, Ohio, assignors to Monsanto Chemical Co., St. Louis, Mo. The method of preventing plant growth which comprises applying allyl phthalate to media normally supporting said growth, said phthalate being applied to said media in a quantity which prevents plant growth.

2,745,815 METHOD AND COMPOSITIONS FOR THE IMPROVEMENT OF SOIL STRUCTURE. Patent issued May 15, 1956 to Dorsey R. Mussell, Clare, Mich., assigner to the Dow Chemical Co., Midland, Mich. A method for the improvement of soil structure which comprises distributing in the soil and in intimate admixture therewith a water-soluble polyethyleneamine, said polyethyleneamine having a viscosity for an aqueous 25 percent solution of at least 20 centistokes at a temperature of 25° C.

2,746,855. POTASSIC NITROPHOSPHATE FERTILIZERS AND METHOD OF PREPARING THE SAME. Patent issued May 22, 1956 to Samuel Ruosch, Visp, Valais, Switzerland. A method of preparing potassic nitrophosphates comprising the steps of decomposing crude phosphates with nitric acid, dehydrating the decomposed produce containing phosphate and calcium nitrate to a water content of substantially not more than about 2.4 moles of water per 1 mole of calcium nitrate, admixing potassium chloride to said decomposed product in an amount sufficient to obtain an end product of about 5 to 14 per cent of K_2O, kneading said mixture at a temperature of about 40 to 65° C. for a time insufficient to react more than 25 per cent of said potassium chloride with said calcium nitrate to form calcium chloride and potassium nitrate, thereby maintaining a ratio of less than one mole of potassium nitrate for each 5 moles of calcium nitrate, and granulating the mixture.

2,747,964. MANUFACTURE OF POLYMERIC PHOSPHATES. Patent issued May 29, 1956 to Cyril Godfray Bacon, Ufford, and David Friend, Trimley St. Martin, England, assignors to Fisons Limited, Felixstowe, Suffolk, England. A process for the manufacture of polymeric sodium tripolyphosphate containing less than about 1% of sodium metaphosphates and less than 1% of sodium pyrophosphates, consisting in neutralising phosphoric acid to produce monosodium phosphate, filtering the liquid mixture to remove impurities, dividing the filtrate into a larger and a smaller part, substantially in the ratio of 2 parts of the filtrate to the larger part to 1 part of the filtrate to the smaller part, neutralising the larger part of the filtrate to form disodium phosphate, mixing the disodium phosphate with the remaining one part of the monosodium phosphate solution to produce a mixed solution in which the constituents are in the ratio of two molecules of disodium phosphate to one molecule of monosodium phosphate, spray drying said mixed solution and subsequently further heating the resultant dried material at a temperature in the range of about 350° C. to about 450° C. for a period of at least 15 minutes to convert it to sodium tripolyphosphate.

2,747,982. METHOD AND COMPOSITION FOR THE CONTROL OF THE GROWTH OF VEGETATION. Patent issued May 29, 1956 to Dorsey R. Mussell, Clare, Mich., assignor to The Dow Chemical Co., Midland, Mich., a corporation of Delaware. The method which comprises exposing growing plants and plants parts to the action of a growth inhibiting amount of a member of the group consisting of 4-chloro-2,-6-disecondarybutyl phenol and 4-bromo-2,-6-disecondarybutyl phenol.

2,749,233. WATER-SOLUBLE, NITROGEN-PHOSPHORUS-CONTAINING PRODUCT AND PROCESS FOR MAKING SAME. Patent issued June 5, 1956 to John E. Malowan, Dayton, Ohio, assignor to Monsanto Chemical Co., St. Louis, Mo., a corporation of Delaware. The process for preparing a water-soluble nitrogen-phosphorus-containing product from the water-insoluble high molecular weight reaction product of phosphorus oxychloride and anhydrous ammonia obtained at a temperature in the range of from 155° C. to 250° C., which comprises hydrolyzing the said reaction product by contacting the same with from 10% to 35% by weight of water at a temperature in the range of from 80° C. to 150° C. in a closed vessel.

2,750,269. PROCESS OF MAKING AN ORGANIC COMPOST. Patent issued June 12, 1956 to George Klein, Menomonee Falls, Wisc. The process of making an organic compost which consists in mixing a bedding composed of straw, wood shavings, corn cobs, alfalfa, rock phosphate and lime with cow manure and urine; second, piling the mixture in windows in the open air; third, thoroughly agitating and mixing the materials in the windows at predetermined intervals; fourth, adding ground corn cobs and alfalfa to the windrows during the turning and agitating thereof according to the moisture content of the windrows until decomposition takes place and finally, screening the decomposed material for uniformity.

2,750,270. PRODUCTION OF SOLUBLE PHOSPHATES. Patent issued June 12, 1956 to Marion D. Barnes, El Doranda, Ark., assignor, by mesne assignments, to Monsanto Chemical Co., St. Louis, a corporation of Delaware. Process of preparing soluble phosphatic materials which comprises the steps of (1) fusing calcium-phosphorus containing material and a material consisting essentially of the residue from step five below, which is primarily ammonium sulfate, (2) separating the water-solubles from the resulting fusion material, leaving behind a water-insoluble residue, (3) reacting aqueous ammonium carbonate solution with said water-insoluble residue, (4) separating the resulting solution from the resulting insoluble material, (5) evaporating said resulting solution to obtain a substantially dry residue, and (6) recycling said dry residue to the fusion step.

• Largest Pulverizer in

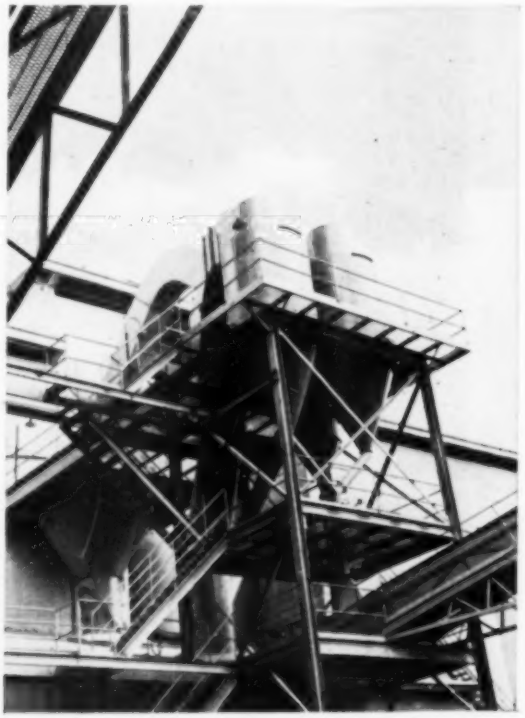
... Doubles Production for Pierce, Florida Plant

To meet a large increase in demand for ground phosphate, The American Agricultural Chemical Co. found it necessary to double the grinding facilities of their Pierce, Fla. operations. After a careful study of available systems, the Kennedy Air Swept Ball Mill System was chosen as the one best suited to grind pebble, concentrate, or a combination of both at the lowest cost. Dependability, continuity of operation, low power, maintenance, and operating labor costs were the prime factors in their decision.

The ball mill has long been used in many industries where continuous production with minimum maintenance and operating supervision is required to keep production costs to an absolute minimum. The simplicity of the ball mill, both in design and operation, makes it the ideal pulverizer.

The Kennedy-Van Saun Air Swept Ball Mill Grinding System is the ultimate in Ball Mill Systems. The Kennedy Radial Flow classifier makes possible production of a wide range of product sizes, by positive external adjustments, to a high degree of accuracy.

The American Agricultural Chemical Co. Grinding Plant — Pierce, Fla.



Kennedy-Van Saun 11' Radial Flow Classifier and Cyclone collectors.

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Florida Phosphate Field

of The American Agricultural Chemical Co.!

OUTSTANDING FEATURES

- **Lower Maintenance**

Tramp iron, manganese, and other foreign material cannot damage system. *No magnetic separation required.*

Grinding balls added while mill is in operation, maintaining constant level of grinding media. Production and fineness remain constant, month after month. No periodic shut-down for lubrication or replacement of wearing parts. Years of operation assured before parts (other than grinding balls) require replacement.

- **Minimum Power**

- **Lower Operating Cost**

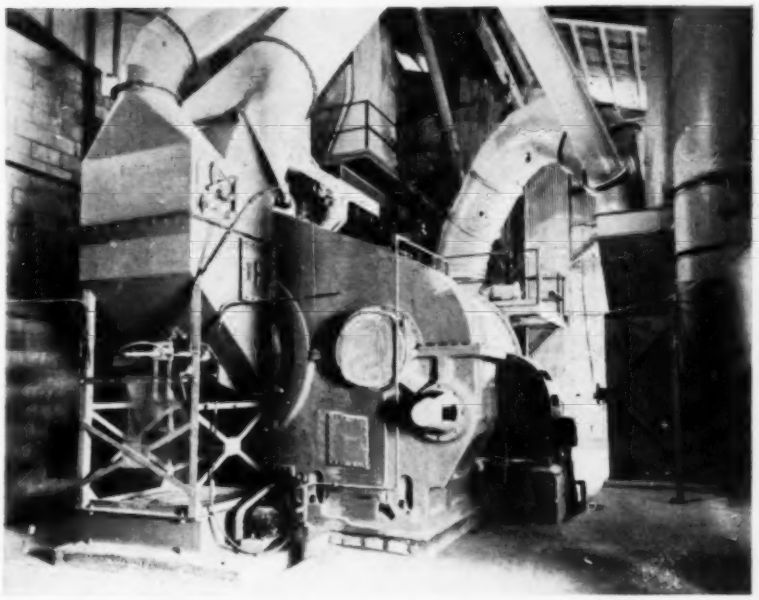
Dependability of equipment and reliable automatic feed control assure high production with minimum operating personnel.

- **Higher Production**

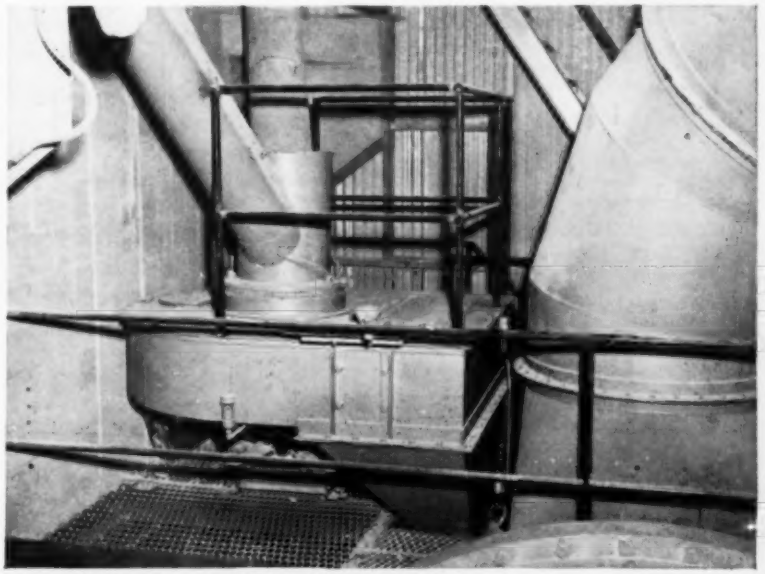
Single grinding unit capacities to 75 tons per hour, requiring less floor space and structural work per ton of production.

- **Flexibility of Design**

Kennedy-Van Saun Air Swept Ball Mill Grinding Systems available in a wide range of capacities to meet your requirements.



Kennedy-Van Saun 10' x 15' Integral Gear Drive Air Swept Ball Tube Mill and #93 Exhauster Fan.



Kennedy-Van Saun 60" Enclosed Disc Feeder

VAN SAUN

Send for Bulletins describing KVS Machinery & Equipment

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INDUSTRY News

Stauffer Merger Approved

Stockholders of both companies recently approved the merger of West End Chemical Co., Oakland, Calif., and the Stauffer Chemical Co., New York. Of the 3,076,705 shares of Stauffer common stock outstanding, 89% voted in favor of the merger and .06% against. Of the 2,012,197 shares of West End Common stock outstanding, 85% voted in favor and .4% against. The merger became effective Oct. 1.

•

Atlanta Ammonia Meeting

How anhydrous ammonia is helping meet the nation's needs for agricultural nitrogen will be reviewed at the sixth annual convention of the Agricultural Ammonia Institute at the Atlanta Biltmore Hotel, Atlanta, Nov. 7-9. The institute's program includes a panel, "Pasture Improvement and Fertilization," which will have as speakers Dr. D. R. Dodd, chairman emeritus of the Ohio State Agronomy Dept.; W. R. Thompson, leader of Extension Agronomy, Miss. State College; and George A. Rogler, research agronomist, Field Crops Research Branch, ARS, Great Plains Experiment Station, Mandan, N. D.

Other leading speakers announced for the program are J. Richard Adams, senior chemist, Fertilizer and Agricultural Lime Section, ARS, USDA, Beltsville, Md.; Dr. Byron T. Shaw, administrator of the Agricultural Research Service, USDA, Washington, D. C.; and Max Fetty, of the Delta Tank Manufacturing Co., Baton Rouge, La.

Jeff I. Davis, of Southeastern Liquid Fertilizer Co., Albany, Ga., and a past president of the institute, is program chairman. A trade show, featuring the latest equipment for applying ammonia directly to the soil, will be open before and after all sessions of the convention.

•

Wilson Elected V-C Head

William H. Wilson, New Orleans executive, was formally elected president of the Virginia-Carolina Chemical Corp., Richmond, at a directors' meeting Oct. 29. A native

William H. Wilson

of Saginaw, Mich., he had been executive vice-president of the Standard Fruit and Steamship Co., which trades primarily in bananas from various Central American countries.

At the same time the company announced that William C. Franklin, who had been serving as acting president of V-C since a change in management control three months ago, has been named permanent chairman of the board. He succeeds former Governor John S. Battle, who will continue to serve as a member of the board.

Mr. Wilson is a graduate of the University of Michigan, did advanced studies at Harvard, and began his business career with the Illinois Tool Works, where he later became administrative assistant to the president. From 1946 to 1951 he served as assistant to the executive vice-president of the Johnson Wax Co., then moved to New Orleans as executive assistant to the president of Standard Fruit and Steamship.

Mr. Wilson, at the time of his appointment as V-C president, stated that he did not intend to make any personnel changes. However, he indicated that some additional persons might be brought in to supplement the company's staff.

•

Calif. Weed Conference

The ninth annual meeting of the California Weed Conference has been announced for Jan. 22-24 at the Fresno Memorial Auditorium, Fresno, Calif., with conference headquarters at the Hotel Californian. Highlighting the program will be discussions on the latest developments in the use of chemicals to control weeds in all phases of California agriculture.

Officers for the conference are James W. Koehler, Calif. State Dept. of Agriculture, president; Dr. Vernon I. Cheadle, Univ. of Calif., Davis, vice-president; Dr. Oliver A. Leonard, Univ. of Calif., Davis, secretary; and J. T. Vedder, Sunland Industries, Inc., Fresno, treasurer.

•

Borax Opens Portland Branch

United States Borax & Chemical Corp., New York, has announced the opening of a new office in Portland, Ore. to handle the development and sales of plant food borates in the Pacific Northwest. The Plant Food Dept. of the Pacific Coast Borax Co. Division of U. S. Borax, which will handle plant food borates, has appointed Glen L. Holt as manager of the new office.

•

AAAS Schedules N.Y. Meeting

"Grasslands in our National Life" has been announced as the theme for Section O of the American Association for the Advancement of Science at its New York meeting Dec. 26-31. The program will include a symposium, companion programs on grasslands by several cooperating societies, and volunteer papers by qualified persons on research and practice.

•

Waggoner To Conn. Post

Paul E. Waggoner, since April head of the Connecticut Agricultural Experiment Station's Department of Climatology, was recently named head of the station's newly-created Department of Soils and Climatology. He has been on the staff since 1951.

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reduce formulating costs

increase flexibility to meet sudden infestations or take advantage of solvent market changes

maintain lower emulsifier inventories

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with NEW ATLOX emulsifiers

The new ATLOX emulsifiers, 4500 and 4600, are based on a chemical material not previously used in the agricultural chemical industry. A patent has been applied for.

Each of these emulsifiers may be used by itself—but their widest use is obtained by blending them. They are not sensitive to in-plant blending variations or to slight changes in solvents. They will perform well at all dilution rates and water hardnesses.

As emulsifiers, ATLOX 4500 and 4600 are news. Every chemist will want to try them out with his chlorinated hydrocarbon insecticides. Samples are available.

And, to help all formulators keep their formulating time and costs at a minimum, Atlas has developed the four new ATLOX Formulating Tools described on the opposite page.

Four NEW ATLOX Formulating Tools

These Tools are designed to help you formulate your chlorinated hydrocarbon insecticides easily, quickly and accurately, with ATLOX 4500 and 4600; giving full consideration to costs, plant facilities and customer needs. The tools help in covering all the steps in formulation:

- Determining the actual field needs of your customers
- Selecting the best emulsifiers
- Verifying the performance of the emulsifiers
- Maintaining quality control
- Maintaining formulating flexibility to meet changing conditions

Atlas Guide to Emulsifier Selection

. . . contains several charts and many pages of test data on chlorinated hydrocarbon insecticides compounded with all the more common solvents, using ATLOX 4500 and 4600 or various blends.

With this data you can

1. Select the *one* best emulsifier for all formulas—or—select *specific* emulsifiers to give peak performance in *each* formula
2. Adjust for mixed solvent systems—possibly reduce solvent costs.
3. Adjust for changes in solvent systems to take advantage of spot purchase opportunities.
4. Adjust for varying field dilution requirements.
5. Adjust for varying field water hardness—prepare concentrates for specific water areas.
6. Select emulsifiers for adding established toxicants to your line—speed the addition of new products.
7. Determine whether it is practical to adjust emulsifier percentages, and thus cut costs.

Because the Guide is useful only to volume formulators of chlorinated hydrocarbon insecticides for agricultural use, it will be presented personally by an Atlas Representative to those who request it on their company letterhead.

Field Evaluation Charts

. . . a guide and check list useful to the chemist in directing his staff, to establish the required conditions of field use and the desired performance. Pads of these charts are available on request.

Suggested Test Methods

. . . methods of testing, adaptable to meet your needs, which make formulation easier, less tedious, faster and more dependable. A motion picture, "Pesticidal Emulsion Testing," a booklet, and reprints of technical articles describing these methods are available on request.

Atlas Formulation and Evaluation Service

Assistance on special problems is available from Atlas laboratories, which are among the most extensive and experienced in the industry. A request through your Atlas representative or a note addressed to Atlas will receive prompt attention.

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ATLAS POWDER COMPANY
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In Canada: Atlas Powder Company, Canada, Ltd.
Brantford, Ontario, Canada

A NEW PLANT
for Calspray at Richmond

Top: J. Earl Coke, vice-president of the Bank of America and former Assistant Secretary of Agriculture, and Cal-Spray president A. W. Mohr examine plans of new installation. Right: The reactor and separator unit is the heart of the Stengel process in the new Richmond plant.

PRODUCTION of plant food chemicals at California Spray-Chemical Corporation's new plant at Richmond, Calif., was officially started October 9th with ceremonies at the new plant headquarters.

J. Earl Coke, vice president, Bank of America and former U. S. Assistant Secretary of Agriculture, speaking at dedication ceremonies for the new plant, spoke of plant food chemicals as the greatest single aid to economic crop production that has developed in this century and prophesied that the next ten years may easily see a quadrupling of their use before potential benefits are realized.

Productive capacity of the new plant is 1375 tons per day (300 tons of complex pelleted plant food, 300 tons of liquid ammonium nitrate, 150 tons of ammonium sulphate, 200 tons of liquid calcium—ammonium nitrate, and 425 tons of aqua ammonia.)—the largest output, in the largest variety, of any plant in the western states. Products will be marketed throughout the eleven western states.

One of the major products will be complex pelleted plant foods. The company plans four analyses,—20-20-0, 20-10-0, 14-14-14 and 16-16-18.

A second division of the Calspray operation will produce ammonium nitrate solutions for use as liquid plant foods. A third division will manufacture ammonium sulphate and a fourth will produce a calcium-ammonium nitrate solution. The company will also market anhydrous ammonia, supplied by the adjacent Standard Oil Company of California, and convert anhydrous to aqua ammonia.

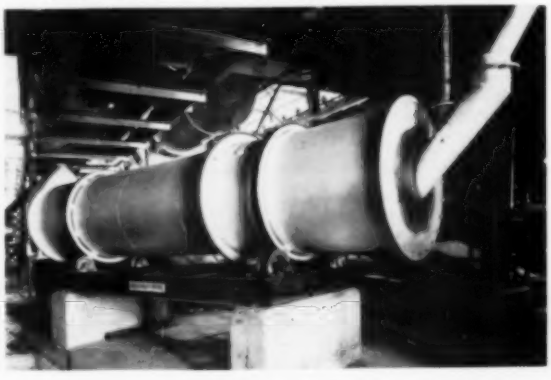
Arthur W. Mohr, president of California Spray-Chemical Corporation, explained the reasons why Calspray entered the plant food field.

"Our studies disclosed a permanent and growing need for plant foods. The average grower at present is not replacing the full amount of essential plant foods that his crops are withdrawing from the soil. He must increase the use of plant foods to maintain crop quantity and quality so necessary for profitable farming.

"We found, too, that while there was sufficient western production of one or two types of plant food, approximately one-third of the total plant food used is being imported from foreign countries or shipped long distances from the Middle West. A local source of supply would mean

A ground level view of the new plant. Building in right foreground contains new automatic bagging and shipping equipment.

The coating drum, which is the final step in Cal-Spray's process of manufacturing plant foods.



better service and would be all-important in a national emergency.

"Our survey disclosed also the need for education as to the best kind and amount of fertilizer for each crop and soil type, and the best timing and placement in order to secure optimum results. We felt that Calspray, with its staff of experienced agronomists and its large, technically trained field force could play an important role in this educational program. The marketing of plant foods, as we have found in our comparatively small-scale experiments during the last three years, can be soundly integrated with the sale of pesticides. The two complement each other.

"And finally, through our parent company, Standard Oil Company of California, we are assured of a dependable flow of the basic materials needed to manufacture plant foods on this vastly increased scale."

The "basic materials" to which Mr. Mohr referred will come from SOCAL's recently completed anhydrous ammonia plant, one of the largest in the western states, and the nitric acid plant, largest single unit of its kind in the world. Deliveries from these plants go by pipeline from SOCAL'S Richmond refinery to the adjacent Calspray plants.

Calspray's complex pelleted plant food will be manufactured by the PEC process, (Potasse et Engrais Chimiques) originating in Europe. This system uses nitric acid, rather than sulfuric acid commonly used in U. S. fertilizer manufacture, as the acidulating agent. "High analysis fertilizers are possible in a simplified operation," observed P. S. Williams, chief engineer for the new plant.

According to Mr. Mohr, the departure from standard practice in plant food manufacture was made only after thorough study of all factors concerned. "We were definitely impressed by the record of agronomic success with nitric acid-based plant foods, which have been used in Europe for over twenty years, but our decision to utilize this system was determined by tests in our own western soil made at the University of California and University of Arizona.★★

Food and Drug Administration Issues Policy Statement on Application for Tolerances

A STATEMENT of policy on application for tolerances on organic phosphate pesticides was issued by the U. S. Food and Drug Administration, October 23rd. The new policy, as published in the *Federal Register* is as follows:

Tests required to establish the safety of organic phosphate pesticides. (a) Recent experiments show that two organic phosphate pesticides, when fed simultaneously to test animals, are far more toxic than the sum of their toxicities when they are fed separately. One potentiates the toxicity of the other. Preliminary studies indicate that similar potentiation of toxicity occurs with certain other combinations of organic phosphate pesticides; potentiation does not occur with some combinations. The data do not suggest a method for determining, without actual testing, when such potentiation will occur. Until other procedures are developed, the toxic effect of each combination of organic phosphate pesticides must be determined by testing the combination on animals.

(b) In considering a petition for a tolerance or tolerances for an organic phosphate pesticide, the Food and Drug Administration will require experimental evidence showing the toxicity of the compounds when fed to test animals with each of the other organic phosphate pesticides that has a tolerance at that time. This requirement will be relaxed if additional scientific evidence shows such action can be taken without hazard to the public health.

Basis of the action is the discovery by FDA scientists that some organic phosphate insecticides may greatly increase the toxicity of others when they are fed simultaneously. For example: it takes 50 parts per million of EPN in the diet of dogs to produce a noticeable effect; it takes 250 parts per million of malathion to produce a noticeable effect; but when only 20 parts per million of EPN and 100 parts per million of malathion are fed simultaneoulsy, the combination is quite toxic to test animals.

Both EPN and malathion are used on food crops, and slight residues of them are permitted on certain commodities when they are marketed. However the official government tolerances do not permit them to be present simultaneously in concentrations that would be toxic. Commissioner George P. Larrick said, "The Food & Drug Administration has been careful in establishing tolerances. There is no indication that the tolerances now in effect for any of the organic phosphates constitute any hazard to the public health. But to be sure that we continue to safeguard the consumer adequately, we are going to require more evidence of safety in dealing with this type of combination in the future."

The new requirements will make it harder for pesticide chemical manufacturers to get new tolerances. For example, a firm that wishes a tolerance for a new compound in this group will have to determine its toxicity and the toxicity of the new chemical when it is combined with each of the five other organic phosphates that already have tolerances—parathion, methyl parathion, malathion, EPN, and systox.

Dr. J. A. Lehman, Chief of the Division of Pharmacology, FDA, says that such extensive testing is necessary because no one knows yet the mechanism by which one organic phosphate increases or potentiates the toxicity of another. However, "as soon as someone works out the mechanism of the potentiation, it may be possible to determine the safety of a new compound with less research than is needed today; we are having to ask for more data now because the fundamental science of this phenomenon (potentiation) is not understood. When we understand this fundamental science, the scope of the problem will become apparent. This may permit a distinct shortening of the research required in this field."

•

Apache to Build New Unit

Apache Powder Co. has announced plans for construction of a 30-ton-per-day ammonia unit at Benson, Arizona. Southwest Agrochemicals is also constructing new fertilizer plants in Arizona, one to be completed in June to have a capacity of 160 tons per day and another to be completed in October with a capacity of 60 tons per day of sulfuric acid and ammonium nitrate solutions.

Pacific NW Assn. Lists Program

The Pacific Northwest Plant Food Association has announced a program for its annual convention at the Harrison Hot Springs Hotel, Harrison Hot Springs, British Columbia, Nov. 7-9. Included in the list of speakers are Russell Coleman, executive vice-president, National Plant Food Institute; James Short, director, Oregon Dept. of Agriculture; Sverre Omdahl, director, Washington State Dept. of Agriculture; and Dr. E. R. Jackman, USDA agronomist at Corvallis, Ore. The Hon. Arthur Laing will be guest speaker at the conventions' annual banquet.

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Graham Joins Armour & Co.

Burton W. Graham, formerly director of commercial chemical development for the Davison Chemical Division of W. R. Grace & Co., has been appointed sales director of the Chemical Division of Armour and Co., Chicago. He had joined Davison in 1944, becoming product sales manager, assistant general sales manager of industrial chemicals, and director of technical service prior to being appointed director of commercial chemical development.

•

Meyer Lists Three Changes

Wilson & Geo. Meyer & Co., San Francisco, distributors of agricultural and industrial chemicals, last month announced three executive shifts effective Nov. 1. John M. Hooper, manager of the Portland office since 1952, was appointed manager of agricultural chemical sales in the Pacific Southwest, with headquarters at Los Angeles. Clifford S. Culley, of the Los Angeles office, will succeed Mr. Hooper as manager of the Portland office.

Thomas H. Lathe was named manager of the newly-formed market development department, Pacific Southwest territory, with headquarters at Los Angeles.

•

Nitrate of Soda Prices Cut

Port prices on Chilean nitrate soda were reduced last month in the first price reduction since 1950. Announcement of a reduction of $1.75 per ton was made early last month in New York by the Chilean Nitrate Sales Corp., and the company attributed the cut to the existence of competititive conditions existing in most forms of nitrogen for fertilizer usage.

The new port prices on the Chilean nitrate of soda were listed as $46 per ton in bulk and $49.50 per ton in 100-pound paper bags. The company has established other prices for delivered nitrate of soda. Domestic producers of sodium nitrate have not as yet announced any change in prices.

New Sulfonates Developed

A series of new petroleum sulfonates that are reported to act both as a source of plant nutrient and as an agent for facilitating utilization of nutrients by plants is being developed by L. Sonneborn Sons, Inc., New York, for use by manufacturers of plant foods. Further information and samples are available at the company's White Oil. Petroleum & Sulfonate Division, 300 Fourth Avenue, New York 10.

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Technicals and Formulations

Insecticides

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Insecticides for Formulators and Producers

DDT—100% Technical
DDT—Wettable Powders
DDT—Dust Concentrates and Emulsions
Lindane—Emulsions, Wettable Powders, Dusts
Lindane—100% Gamma Isomer of BHC
BHC—40% Technical
BHC—12% Wettable Powders and Dusts
BHC—Emulsion Concentrates
K-101—Miticide

Weed Killers and Brush Control Chemicals

DIAMOND weed and brush killers, based on the 2,4-D and 2,4-T chemical groups, meet every weed and brush control problem.

These dependable DIAMOND herbicides are produced in two forms: *Technical* for use by formulators and processors in their own formulations and *ready-to-use formulations* for farmers, ranchers, country clubs and homeowners.

Technicals for Formulators

WEED KILLERS

2,4-D Acid • Technical Butyl-D
Technical Isopropyl-D
Technical 2-Ethyl Hexyl (Iso-Octyl)-D (Low Volatile)
Technical BEP-D (Low Volatile)

BRUSH CONTROL

Technical Butyl-T • Technical Isopropyl-T
Technical BEP-T (Low Volatile)
Technical 2-Ethyl Hexyl (Iso-Octyl)-T (Low Volatile)

Ready-To-Use Formulations

WEED KILLERS

*4# Mixed Amine-D • 4# Dimethylamine-D
2.67# Butyl-D • 4# Butyl-D • 6# Butyl-D
4# 2-Ethyl Hexyl (Iso-Octyl)-D (Low Volatile)
4# BEP-D (Low Volatile) • 3.34# Isopropyl-D

BRUSH CONTROL

*4# Butyl-T • 4# BEP-T (Low Volatile)
4# 2-Ethyl Hexyl (Iso-Octyl)-T (Low Volatile)
2,4-D—2,4,5-T Mixtures • 2#—2# Butyl Brush Killer
2#—2# 2-Ethyl Hexyl Brush Killer (Low Volatile)
2#—2# BEP Brush Killer (Low Volatile)

*Numbers are pounds of 2,4,5-T or 2,4-D acid equivalent per gallon.

DIAMOND research is constantly seeking new and better insecticides and herbicides and working with formulators and agricultural chemists in the development of more efficient forms and application methods. We will be glad to work with you. For information on DIAMOND Chemicals and technical co-operation write, DIAMOND ALKALI COMPANY, 300 Union Commerce Building, Cleveland 14, Ohio.

DIAMOND CHEMICALS

Diamond Chemicals

Kaiser to Build Pilot Unit

A $400,000 contract for construction of a pilot acid neutralizing plant at Nichols, Fla., was awarded recently to a Lakeland construction firm by the Kaiser Aluminum & Chemical Corp., Oakland, Calif. The plant will neutralize waste acid from the phosphate industry, producing a salt for use in the corporation' chemical operations. The 40-acre site for the plant, which is expected to be completed early in 1957, was purchased from the Virginia-Carolina Chemical Corp.

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Richardson Names Bandstra

Hart Bandstra has been appointed advertising manager of the Richardson Scale Co., Clifton, N. J. He will be responsible for coordinating the company's entire sales promotion program, including all advertising and publicity activities. A veteran of nearly 40 years with Richardson, Mr. Bandstra was service and parts manager prior to his new appointment.

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IMCC Names Midwest Rep.

Jack von Mettenheim was recently appointed a Midwest sales representative by the Potash Division of International Minerals & Chemical Corp., Chicago. He had been associated with the company since 1953, first with its Plant Food Division and since July of this year with the Potash Division. He had been district sales manager for the Agricultural Dept. of Farbwerke Hoechst before coming to the U. S. from Germany in 1948.

•

New English Sulfuric Unit

New facilities for production of sulfuric acid and ammonium sulfate were completed recently at Phoenix Wharf, England by the United Kingdom's South Eastern Gas Board. The new units will use spent oxide and liquors from the board's gas manufacturing plant for conversion into sulfuric acid, and will have a capacity of 44,000 tons of 77% sulfuric acid and 30,000 tons of ammonium sulfate. The sulfuric acid plant is the first in the United Kingdom to employ the Kachkaroff process.

FMC Sales Up, Earnings Off

Ernest Hart, president of the Food Machinery & Chemical Corp., New York, last month told the New York Security Analysts that company earnings will be only slightly better than last year, but that sales would be 12% greater for 1956 than for last year. He cited major recurring expenses, plus a strike at the chlor-alkali division, as the main factors in the drop in the company's earnings.

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Elsas Fulton Bag Pres.

Clarence E. Elsas was elected president of the 88 year old Fulton Bag & Cotton Mills, succeeding R. O. Arnold, who resigned to devote full time to private interests. Announcement of the action taken by Fulton's board of directors came from Bernard A. Mitchell, chairman of the company's executive committee, following a meeting held in New York City recently.

Mr. Elsas was elected executive vice president in June, 1956, when a new controlling group purchased the Fulton Bag & Cotton Mills. Mr. Mitchell, a member of the new ownership group, stated since they took control of Fulton, the company has made exceptional strides in operating profitably and expanding its sales to an all-time high. Current assets as of September 1, were better than twelve and one-half million dollars, as against current liabilities of a little more than four million dollars, or a ratio of better than three to one. He said the Company's net worth was $16,709,555.

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J. Hayden Twiss Dies

Joseph Hayden Twiss, president of the House of J. Hayden Twiss, advertising agency that specializes in agricultural chemical accounts, died October 5. He founded the agency in 1928 after a short career as a publisher of architectural publications, and was a member of the N. Y. Chemists Club.

William A. Smith has been elected president of the agency, to succeed Mr. Twiss, who died Oct. 5. Fred J. Schlutow was named first vice-president and treasurer.

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New Mo. Liquid Plant

The Lafayette Farm Supply, Lexington, Mo., recently began operations of its new complete liquid fertilizer plant to serve the Missouri River basin area in Western Missouri. The plant, engineered by Ellsworth Equipment & Engineering Co., Indianapolis, includes an anhydrous ammonia converter and a Hydro-Cycle completely automatic mixing system, and will have a capacity of 15 tons per hour. Trade name of the product is "Ezy-Spred."

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NWAC Conf. Jan. 23-24

The fourth annual Pacific Northwest Agricultural Chemicals Industry Conference will be held Jan. 23-24 at the Benson Hotel, Portland, Ore. It will be under the auspices of the Western Agricultural Chemicals Association.

At the same time the WACA announced that the Pacific Northwest Vegetable Insect Conference and the Northwest Cooperative Spray Project will meet at the Imperial Hotel, Portland, Ore., Jan. 21-25. There will be a joint meeting of industry representatives Jan. 24.

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Franklin Predicts V-C Gain

William C. Franklin, acting president and a director, last month predicted that the Virginia-Carolina Chemical Corp. "will be in the black" for the first quarter of the 1956-57 fiscal year, which ended Sept. 30. He told the company's annual meeting that earnings for the year ending next June 30 will register a "substantial" improvement over the $6.47 a share earned during the last fiscal year. At the same meeting, the company elected Overton D. Dennis, vice president and treasurer of Chesapeake Corp. of Virginia, a member of the board, and reelected the eight incumbent members.

New Phosphate Pesticide

"Trithion," or "Compound R-1303," a promising new phosphate pesticide for control of scale insects, mites, and aphids, was recently put into pilot plant production by its developer, Stauffer Chemical Co., New York. A report on progress of the new insecticide was presented to the Division of Agricultural and Food Chemistry at the September ACS meeting in Atlantic City, by L. W. Fancher of Stauffer.

Mr. Francher reported that Trithion is currently being sold only for application on ornamentals and non-food crops, but that it has shown special promise for control of the clover mite, the European red mite, wooly apple aphid, spotted alfalfa aphid, California red scale, yellow scale, and many others. He pointed out that it is not effective against citrus bud mite, citrus thrips, cotton boll weevil, and cabbage looper.

Trithion is the *p*-chlorophenylthiomethyl ester of *o,o*-diethyldithiophosphoric acid. The pure compound is a water-white liquid, but the technical product from pilot plant production is light yellow and of 95% minimum purity. According to Mr. Francher, it shows little or no phytotoxicity to apples, pears, peaches, plums, grapes, beans, cotton, and citrus fruits.

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Wash. Ground Sprayers Elect

The Washington Association of Ground Sprayers, at its annual meeting held recently at the Morck Hotel, Aberdeen, Wash., heard addresses by Attorney General Don Eastvold and Senator Albert Rossellini, Republican and Democratic candidates for governor. Both pledged complete support to the ground sprayers' program, and also condemned failure to enforce sprayers' licensing requirements.

The association elected George Mock, Jr. president, T. A. Ziegler and Robert M. Dye vice-presidents, Jennings P. Felix secretary-treasurer, and John Harshman, John Beheyt, Russell Faulkner, A. H. Hembree, and Frank Scarbery to the board of directors. The association also announced that a short course for license testing will be held Nov. 29-30.

New National Potash Company Mine Nears Completion

A 400-ton ore surge bin in the refinery area is nearing completion at National Potash Company's new mine near Carlsbad, N.M. At right is the refinery section and at left the crushing and screening building.

Construction work at National Potash Company's new mine near Carlsbad, New Mexico, is nearing completion, with shipments due to begin in February. The company, from its headquarters in New York, reports that the two mining shafts are down to ore level, the 21-mile water pipeline is in operation, and construction on the refinery and other facilities is proceeding on schedule.

The $19 million project will have an annual capacity of 400,000 tons of high grade muriate of potash guaranteed 60% K_2O. The company will offer fertilizer manufacturers a granular product of 10 + 28 mesh, and a standard product of —28 + 48 mesh.

Product storage buildings, already completed, have a capacity of more than 100,000 tons. Provisions are being made for quick loading of the bulk or bagged product into covered hopper cars or standard box cars.

F&B Expand Product Line

Faesy & Besthoff, Inc., New York, recently added five new products to its line of garden and home agricultural chemicals. The new list includes nitrate of soda, sulfate of ammonia, muriate of potash, superphosphate, packaged in five and ten-pound bags, and a "rabbit and deer chaser," in five-pound bags.

The nitrate of soda is guaranteed to contain 16% nitrogen, and is designed for encouraging leafy growth. It is a granulated product which dissolves readily in water. The sulfate of ammonia, containing 20½% available nitrogen, is also in granular form, and has slower starting but longer lasting qualities than the nitrate of soda.

The F&B muriate of potash, with a guaranteed 60% soluble potash, is granulated and recommended for promoting root and tuber growth. For building upright stems, giving rich and luxuriant color, and stimulating early ripening, the company is recommending its new superphosphate, with minimum 20% available phosphoric acid. The rabbit and deer chaser is a formulation to discourage, without harming wild animals from garden foraging.

•

Vulcan Names Ferguson

Vulcan Containers Inc., Bellwood, Ill., have appointed Lawrence M. Ferguson, to the post of sales manager. An 18-year veteran with the company, he was instrumental in research and development of many of the company's techniques in varied coatings for the interior of steel shipping pails. Mr. Ferguson was also one of the chief developers of the Vulcan storage warehouse facilities.

•

Garman to New Best Post

Dr. William L. Garman was recently named vice-president in charge of the agricultural chemicals division of Best Fertilizers Co., Oakland, Calif. He was a former agricultural service manager for the Grand River Chemical Division of Deere & Co., Tulsa,, and prior to that was in the agronomy department at Cornell University.

Allied Outdoor Poster Program

Major increase in outdoor posting is scheduled this fall for Allied Chemical & Dye Corp.'s Arcadian 12-12-12 fertilizer and Uran spray, following test program in rural markets last winter by company's Nitrogen Division. The expanded outdoor program will cover selected agricultural regions in twelve states. Posters are designed for long-range readability by farmers driving to and from market centers.

IMCC Previews New Film

"Out of the Earth," a wide-screen full color film, received its world premiere at a special press conference in New York Oct. 23. The film illustrates mining and manufacturing processes in the Phosphate Minerals, Phosphate Chemicals, Plant Food, Potash, and other divisions of the International Minerals & Chemical Corp., Chicago, and was later shown to the company's stockholders at their annual meeting.

Intended for both the layman and members of industry, the film will be shown in the various cities at which International maintains mines, plants, and research centers. It depicts extraction of phosphate in Florida, mining of potash in New Mexico, and operations in a number of other widespread locations. Louis Ware, International Minerals president since 1939, introduced the film.

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S. Weed Conf. Jan. 23-25

Problems in control of specific weeds in specific crops will be analyzed at the 10th annual meeting of the Southern Weed Conference in Augusta, Georgia, January 23-25 at the Bon Aire Hotel.

The conference program will include all phases of research and education in chemical weed control. Dr. W. B. Albert of the South Carolina Station, Clemson, is president of the conference.

Among the general topics planned for the program are fundamental aspects of weed control, control of specific weeds, control in specific crops, aquatic weed control, weed control in pastures and turf, weed control in non-crop areas, horticultural weed control, and new developments. Dr. J. K. Leasure of Dow Chemical Co., is program chairman.

S. C. Fertilizer Tonnage Up

South Carolina fertilizer tonnage for the quarter ending Sept. 30 rose 1,664 tons, or 4.02% over the figure for the same period last year, reported B. D. Cloaninger, director of the department of fertilizer inspection and analysis at the Clemson Agricultural College, Clemson, S. C. Mr. Cloaninger reported a figure of 43,019 tons this year, compared with 41,355 in 1955. At the same time he announced that "Bulletin #441, Inspection and Analysis of Commercial Fertilizers in South Carolina" would be ready for distribution during the first part of November.

NPFI Sponsors Soil Conference at Atlanta

PLANS have been completed for the first annual Southern Soil Fertilizer Conference, to be held at the Atlanta Biltmore Hotel, Atlanta, on November 2. The conference, sponsored by the Southern Regional Soil Research Committee and the National Plant Food Institute, will bring together soil scientists, agronomists, and fertilizer leaders from 13 southern states to discuss the importance of maintaining, replenishing, and increasing the fertility of southern soils.

The Southern Soil Research Committee is composed of one soil scientist from each of the 13 southern land-grant colleges and universities plus soil scientists from the Agricultural Research Service and the Soil Conservation Service of the United States Department of Agriculture.

A feature of the meeting will be a discussion of the "Soil Bank" program for agriculture and a question-and-answer period relating specifically to its effect upon the fertilizer industry. A representative of the United States Department of Agriculture will be present to answer questions and to participate in the program.

Registration for persons attending the Conference is scheduled for Thursday, November 1, from 3:00 p.m. to 8:00 p.m.

The Conference will begin Friday morning, November 2 at 9:30 a.m., with Howard T. Rogers, Alabama Polytechnic Institute, presiding. W. E. Colwell, N. C. State College and C. T. Prindeville, National Plant Food Institute, will make the opening remarks. They will be followed by:

L. B. Nelson, Head, Eastern Soil and Water Management Section, USDA, speaking on "Off-Season Fertilizer Potentials in the South" and W. R. Thompson, Pasture Specialist, Mississippi State College, speaking on "Two Acres of Pasture on One Acre of Land."

Mr. Colwell will preside at the afternoon seassion, which will feature an address by M. S. Williams, Chief Agricultural Economist of the Institute, on "Fertilizing and Liming for Most Efficient Crop and Livestock Production" and a Grade-Ratio Committee Report by J. W. Fitts, N. C. State College and Frank Boyd, president, Alabama Soil Fertility Society. Mr. Colwell will be moderator on a question-and-answer period which will follow.

The program committee for the conference follows:

W. H. Garman, National Plant Food Institute, chairman; J. W. Fitts, N. C. State College; W. R. Paden, Clemson Agricultural College; R. W. Pearson, USDA and Alabama Polytechnic Institute; C. M. Wilson, Alabama Polytechnic Institute; T. F. Bridgers, Farmers Cotton Oil Company, Wilson, N. C.; H. Vise Miller, Armour Fertilizer Works, Atlanta, Ga.; and W. F. Nichols, Sylacauga Fertilizer Company, Sylacauga, Ala.

Oil Chemists Hear Surfactant Report

by H. H. Slawson

THE use of fertilizers treated with surfactants resulted in yield increases and improved acceptance of the resulting crop by cattle, according to a report presented to the recent fall meeting of the American Oil Chemists Society by James E. Seymour, Illinois Farm Supply Co., Collinsville, Ill. A report on experimental use of fertilizers, treated with surfactants to facilitate processing and reduce caking, was presented to members of AOCS at their meeting in Chicago, Sept. 24-26, by Mr. Seymour, who conducted a test project for this cooperative buying agency, owned and operated by 200,000 Illinois farmers during the summer of 1953.

He was conducting field tests to compare the effect of various fertilizer treatments on both yield quantity and quality. Results, he said, "lead us to the belief that we could discern both yield increases and positive animal taste preference on the portion of plots treated with mixed fertilizer containing a small amount of surfactant added to facilitate processing and reduce caking."

Mr. Seymour reported these findings at a meeting of the American Farm Research Association in the fall of 1953. Meanwhile, considerable publicity had been given the results of research efforts of the Atlantic Refining Co. and the USDA relating to use of surfactants as soil additives.

"The astounding results indicated by the Atlantic Refining Co.," said Mr. Seymour, "were of sufficient magnitude to stimulate others to consider or initiate research projects relative to this new use of surfactants. Because of our previous work relative to use of surfactants in manufacture of fertilizers, Illinois Farm Supply Co. immediately initiated a broad research project designed to thoroughly investigate this new agricultural application of surfactants."

"Findings to date, he said, "have been controversial, inconclusive and somewhat confusing. Other available research results are likewise controversial, inconclusive and confusing. But this aspect of past research, in itself, demands further research that will, in all probability, elucidate the mechanism of the functions of surfactants as soil additives and plant growth stimulants."

Summing up specific results of the research conducted under his direction, Mr. Seymour said, "they indicate that surfactant application to certain Illinois soils can accelerate the infiltration rate by 300 percent. Our results also indicate that the treatment of certain Illinois soils with very small quantities of specific surfactants can significantly increase the water holding capacity of the soil. The soil tilth on our experimental plots appeared to be improved in many instances. Our results indicate also that surfactant applications possibly result in increased emergence rate and increased plant survival."

Reviewing the literature on previous investigations, Mr. Seymour said the Atlantic Refining Co. had reported that use of surfactants as a soil additive facilitates soil water intake by 380 percent.

A USDA scientist, E. R. Lemon, he said, theorized that surfactants affect the economy of water utilization by increasing the infiltration rate and decreasing the evaporation rate. Also, that dry soil "mulching" is accelerated by "decreasing the water holding capacity of the surface layer of the soil and reducing the rate of capillary movement of water from lower soil depths." Mr. Lemon also pointed out, Mr. Seymour reported, that unidentified mechanisms affecting the various relationships were obviously in operation.

Continuing, Mr. Seymour reviewed other reports which seem to agree that surfactant-treated soils have a higher moisture content than do non-surfactant treated controls. One Idaho investigator, he said, reports that irrigation of a slope on an experimental plot resulted in high run-off where no surfactant was used, but that whenever a surfactant was used as a soil additive all the applied water was absorbed by the soil.

As to crop response, Mr. Seymour said examination of Atlantic Refining Co.'s results indicates (under the imposed experimental conditions) a yield increase of 31 percent for brush beans; 177 percent for carrots; 84 percent for tomatoes; 9 percent for wax beans and less than 1 percent for field corn; a 6 percent decrease in yield for potatoes; an increase in content of reducing sugars, in some instances vitamins, and enhancement of absorption of applied phosphorus by bush beans.

Experimental results at the University of Wisconsin, also reviewed by Mr. Seymour, indicate significantly increased yields for certain crops grown on certain soil types, and no significant yield increases for other crops. At Southern Illinois University, he said, no yield increase resulted from use of surfactants on wheat plots, although this may have been due to a severe drought that summer. He reviewed results of work with surfactants as soil additives at the Univ. of Illinois and Kansas State University and by Universal Detergents, Inc. His list of references accompanying his paper indicates that none of the reports reviewed have as yet been published.

Results from the Illinois Farm Supply Co. experimental plots, he stated, reveal no significant increase in yield for field corn, soybeans, wheat, red clover, rye grass and oats.

The existing experimental and incompatible results of both field and laboratory experimentation, Mr. Seymour said, stimulate further work that will either validate or invalidate basic understanding of the problems and the working hypothetical concepts involved. Among questions demanding further experimentation, he listed the following:

(a) Are the surfactant functions that result in plant growth stimulation synonymous with surfactant functions resulting in alteration of soil properties?

(b) Why does the selective addition of surfactant to specific soils in-

(*Continued on Page* 112)

Calif. Advances Dick, Lemmon

Charles V. Dick was recently appointed to the newly created post of assistant director of the California State Dept. of Agriculture. He will be in charge of the department's legislative program, and the director's liaison officer for the division of plant industry. At the same time the department announced the appointment of Allen B. Lemmon to succeed Mr. Dick as chief of the division of plant industry.

As chief of the division of plant industry, Mr. Lemmon will direct and cordinate the bureaus of plant quarantine, entomology, plant pathology, rodent and weed control and seed inspection, field crops, and chemistry. He is a former president of the Association of American Fertilizer Control Officials and the Association of American Pesticide Control Officials. Mr. Lemmon's duties will be assumed by Robert Rollins, assistant chief, who will become acting chief-in-charge of the bureau.

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Kraft Paper Prices Up

Two major kraft paper producing companies announced price increases last month. International Paper Co., New York, increased prices for finished paper bags by 5%, and the St. Regis Paper Co. boosted its prices on kraft paper approximately 3%

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Argentina To Buy Pesticides

The U. S. agricultural attache in Buenos Aires reported recently that the Argentine Government has authorized the importation of pesticides to combat grasshoppers during that country's coming spring and summer. In the Southern hemisphere, spring and summer correspond to fall and summer in the U. S. Import permits will be issued for 275 metric tons of dieldrin and 225 tons of heptachlor.

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CI Purchases Wm. Stone Co.

William Stone Sons Ltd., 80-year old fertilizer, feed, and hide firm at Ingersoll, Ont., was recently purchased by Canadian Industries Ltd., Montreal. Announcement of the purchase was made by F. H. Stone, retiring president of the company.

V. B. Lillie, general manager of Canadian Industries' agricultural chemicals division, was named new president of William Stone. According to the announcement, the transfer of ownership will not affect the company name or its general policy.

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Dr. Cohen Joins O-M

Dr. Sylvan I. Cohen has joined Olin Mathieson Chemical Corp., New York, as an agricultural research specialist in the Insecticides Division at Port Jefferson, N. Y. He was formerly vice-president for research of Gallowhur Chemical Corp., Ossining, N. Y. Much of his work has been in the development of mercurial seed disinfectants and other organic foliage fungicides. He holds patents on several compounds.

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To Mine Offshore Sulphur

The first completely offshore sulphur mining operation in history will be undertaken by Freeport Sulphur Co., New York, at a deposit discovered recently in the Gulf of Mexico by Humble Oil & Refining Co. The deposit, located off Louisiana in 45 feet of water six miles from land, reportedly "ranks among the most important sulphur discoveries in recent years."

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Fulton Bag Names Two

Two district sales appointments have been announced by the Bag Division of Fulton Bag & Cotton Mills, New Orleans. C. D. Masone has been named New York City sales representative and Donald M. Lins was named sales representative for southern Florida.

Florida Leaflet Issued

A new leaflet entitled "The Florida Bankers Association Advocates Good Soil Fertility Practices Because . . ." was recently prepared by the University of Florida and the National Plant Food Institute — especially for the Florida Bankers Association.

In the leaflet, the Florida Bankers Association urges all Florida farmers "to take advantage of this (soil testing) service in the interest of higher crop yield and more economic agricultural production." Brief instructions for taking a soil sample are given on the back page of the leaflet, and farmers are asked to write for more detailed instructions to the Soils Department, Agricultural Experiment Station, Gainesville, Florida, or to inquire through their local county agricultural agents. Of the 40,000 leaflets printed, 35,000 will be distributed through the Florida Bankers Association; and 5,000, through the University of Florida.

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Faesy & Besthoff Moves

Faesy & Besthoff, Inc., manufacturer of garden and home chemicals and a distributor of industrial and farm chemicals, has moved its New York offices to 25 East 26th Street, New York 10. New Telephone number is MUrray Hill 4-2700.

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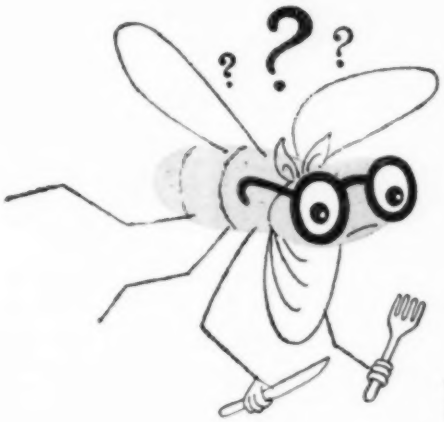
Kolker to Expand Plant

Kolker Chemical Corp., Newark, has installed new facilities for the production of methyl bromide at its plant in Newark. When put into full production, the new unit will allow the company to double its present methyl bromide capacity.

Sugar Beet Damage
Every country has its own variety of insect troubles. In Italy, farmers are plagued with a soil insect called Cleono which severly damages sugar beets. To prevent the damage, Italian farmers are using soil insecticides. The photo compares a beet from an untreated field with an undamaged beet from a field treated with heptachlor.

Flies can't read...



but CRAG Brand Fly Repellent keeps them off

Flies learn in a hurry that they're not wanted when cattle are sprayed with formulations containing CRAG Fly Repellent. Your customers will earn bigger profits because cattle protected by sprays based on CRAG Fly Repellent give more milk or beef.

Your profits will go up, too, because satisfied customers will come back for more of their favorite spray based on CRAG Fly Repellent.

Find out how you can formulate top-quality livestock sprays with CRAG Fly Repellent. Sample labels and other information are available. Fill in and mail the coupon now!

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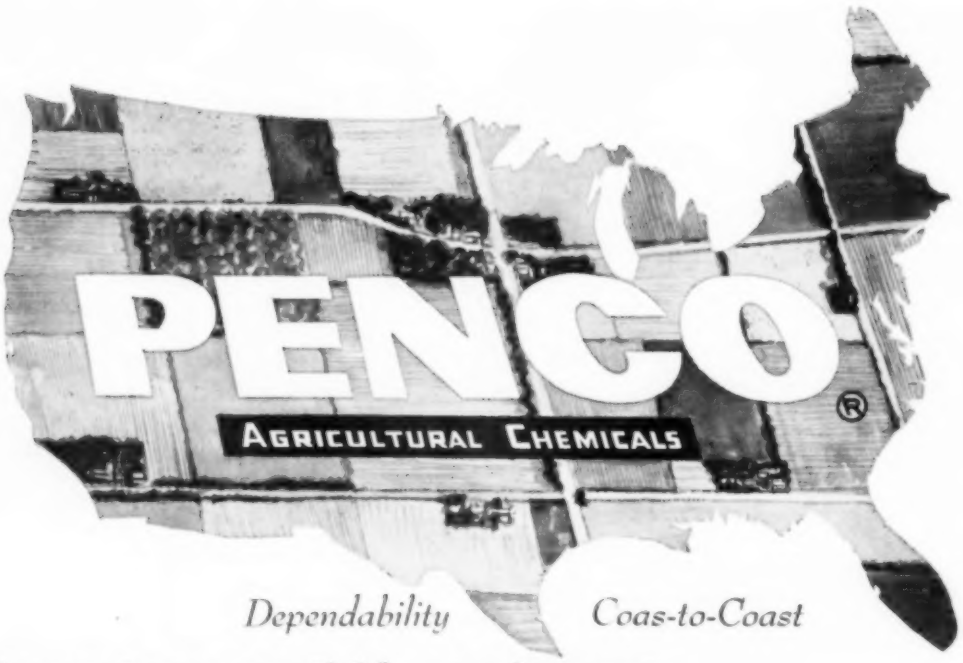

To meet your pesticide requirements . . .

PENCO DDT PRODUCTS

PENCO DDT Technical—lump, flake, or ground
PENCO PENTECH®—exclusive, friable, ground technical DDT
PENCO DDT D-50—50% DDT dust base
PENCO DDT W-50—50% DDT wettable powder
PENCO DDT Emulsions 25 and 34—emulsifiable concentrates containing 2 lbs. and 3 lbs. of DDT per gallon, respectively
PENCO DDT S-3—solution concentrate containing 3 lbs. DDT per gallon
PENCO Granular 5% DDT—special granular formulation for corn borer control

PENCO BHC PRODUCTS

PENCO High Gamma BHC Technical—typically 46% gamma isomer
PENCO BHC Technical—typically 14% gamma isomer
PENCO BHC W-12—12% gamma isomer wettable powder
PENCO BHC-DDT D-9:15—dust base concentrate
PENCO BHC E-11—emulsifiable concentrate containing 11% gamma isomer or 1 lb. gamma isomer per gallon
PENCO Granular 2% BHC—special granular formulation

PENCO HARVEST AIDS

PENCO DE-FOL-ATE® — magnesium chlorate-type defoliant for cotton
PENCO Endothal* Harvest Aid—liquid desiccant for many seed crops and defoliant for certain crops
PENCO Penta Concentrate 40
PENCO Desiccant L-10—liquid defoliant-desiccant for cotton

PENCO LINDANE PRODUCTS

PENCO Lindane—Technical; wettable powder (W-25); emulsifiable concentrate (E-20); and Transplant Liquid

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A complete line of liquid and dust formulations of BHC, DDT, Toxaphene, Aldrin, Dieldrin, Endrin, Heptachlor, and other approved cotton pesticides.
PENCO Calcium Arsenate — 70% tri-calcium arsenate powder
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PENCO Pentachlorophenol Technical
PENCO PENITE®-6X—sodium arsenite solution used as non-selective herbicide and potato top killer
PENCO Sodium Chlorate—powdered form for general non-selective weed control
PENCO KRYOCIDE® and PENCO Super-Seventy — natural cryolite insecticide powders
PENCO Malathion—wettable powder (W-25) and emulsifiable concentrates (E-8, E-5, and E-50)
PENCO Parathion—wettable powders (W-15 and W-25)
PENCO Ferbam—organic fungicide
PENCO Dieldrin W-50—50% wettable powder
PENCO Aramite—wettable powders (W-15 and W-30)
PENCO Sytam—systemic insecticide

*Endothal is the accepted generic name for 3,6-endoxohexahydrophthalic acid. The manufacture and use of endothal products are covered by one or more of the following U. S. Patents: 2,550,494; 2,576,080; 2,576,081; 2,576,083; other patents pending.

FOR INFORMATION ON THESE PRODUCTS, CONTACT:

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Aurora, Ill. TACOMA, WASHINGTON Bryan, Tex.
Los Angeles, Calif. Berkeley, Calif. Montgomery, Ala. Philadelphia, Pa.

WESTERN DIVISION, PENNSYLVANIA SALT MANUFACTURING COMPANY

Pennsalt Chemicals

ASAE Section Lists Program

Various discussions on fertilizer placement will highlight the meeting of the Power and Machinery Section of the American Society of Agricultural Engineers Dec. 12 at the Edgewater Beach Hotel in Chicago. The section will hold its annual meeting in cooperation with the National Joint Committee on Fertilizer Application.

Among the principal speakers will be W. C. Hurlburt, USDA, speaking on "Machinery for Fertilizer Placement;" William R. Bone, Monsanto Chemical Co., "Trends in the Use of Liquid Fertilizers;" H. F. Miller and C. W. Gantt, USDA, Developments in the Application of Liquid Fertilizers;" and L. N. Wise and T. N. Jones, Miss. State College, "Fertilizer Placement for Grain Seedings in Permanent Sods."

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Ask To Re-open Texas City

The U. S. District Court for the Southern District of Texas last month agreed to entertain a reorganization petition for Texas City Chemicals, Inc. The petition is based on a plan submitted by Smith-Douglas Co., Norfolk, Va., and proposes that that company shall reopen and operate the Texas City plant for the court's trustee, and that Smith-Douglass will participate in the reorganization proceedings on a basis of its becoming the controlling stockholder of Texas City Chemicals.

The announcement by the Norfolk firm said that the plan had been tentatively accepted by a number of creditors of Texas City Chemicals. If the reorganization plan is confirmed, arrangements have been made to refinance Texas City through F. Eberstadt & Co., New York investment counselors.

Texas City Chemicals, Inc. completed a large dicalcium phosphate plant at Texas City, Tex., in 1954; but encountered financial difficulties shortly after the plant was completed, and closed down the entire operation in January of this year. It has facilities for producing sulphuric acid and phosphoric aicid, in addition to dicalcium phosphate.

Smith - Douglass, manufacturer and distributor of chemical fertilizers along the Atlantic Seaboard, the Midwest and Southwest, already operates an anhydrous ammonia plant near Houston, Texas, through its subsidiary, the San Jacinto Chemical Co. Smith-Douglass last month transferred some of its personnel to Texas City to commence plant start-up operations. Dale C. Kieffer, technical director, will be in charge of production, assisted by W. O. Johnson and Howard C. Hendron. Herbert Britain, home office budget section supervisor, has been transferred to establish a financial section.

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Oregon Lime Plant

The Chemical Lime Co. of Oregon, will shortly complete a new $1,250,000 chemical lime plant near Baker, Ore. The plant will be built on a 220-acre site close to one of the largest known high-grade lime deposits west of the Rockies, and will have an announced annual production of 75,000 tons of chemical and hydrated lime. Robert G. Vervaeke, formerly with Gladding MacBean, will be general manager of the plant, and is currently in charge of installation.

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Nitrogen Division in Raleigh

Nitrogen Division of Allied Chemical & Dye Corp., New York, last month announced the opening of a district sales office at 606 Capital Club Building, Raleigh, N. C. The new office is under the direction of John R. Ritter, who was named direct application materials sales manager for the state of North Carolina.

•

CSC Names Walter Young

Commercial Solvents Corporation has named Walter M. Young to its expanding agricultural chemicals marketing and distribution organization. Mr. Young is assigned to the Southern sales district, headquarters of which are at the Company's Sterlington, Louisiana, office. He will reside in Mt. Pleasant, Texas, with sales responsibilities covering the states of Texas, Oklahoma and parts of Arkansas and Louisiana.

Calif. Fertilizer Meeting

A panel discussion titled "Some Aspects of Fertilizer Industry Economics" will be among the highlights of the thirty third annual convention of the California Fertilizer Association to be held Nov. 11-13 at the Hotel del Coronado, Coronado, Calif. The panel will be moderated by Dr. Daniel G. Aldrich, Jr., chairman of the Dept. of Soils and Plant Nutrition, University of California, Davis, and will include George Monkhouse, Shell Chemical Corp., San Francisco; Ned Lewis, Wilbur-Ellis Corp., Los Angeles; J. Earl Coke, Bank of America, San Francisco; and Dr. Philip Neff, Planning Research Corp., Los Angeles.

Dr. Neff, Los Angeles economist, will speak on "Costs, Markets, and Prospects in the Fertilizer Industry," and Elmer Wheeler, sales management spokesman of Dallas, Texas, will give an address on "Selling the Sizzle in the Fertilizer Business."

More than 600 persons are expected to attend the meeting.

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McCarthy to Commerce Dept.

Vern I. McCarthy, Jr., vice-president of Vulcan Containers, Inc., Bellwood, Ill., manufacturers of steel shipping containers, was recently named to serve a six months appointment as deputy director of the Containers and Packaging Division of the Business and Defense Services Administration, in the Department of Commerce.

In the post Mr. McCarthy will represent the American packaging and container industry, and will be responsible for reflecting the over-all activities of the container industry with the Federal government. As deputy director he will participate in the development of long-range mobilization planning and industrial defense preparedness programs for the industry in the event of national emergency.

Mr. McCarthy has been active in the research and product development activities of Vulcan's Steel Pail and Tin Can Divisions, and was instrumental in the development of the company's unique warehouse inventory system.

Nitrogen Prices Lowered

The Mississippi River Chemical Co., St. Louis, a division of Mississippi River Fuel Corp., recently announced a reduction in the price of nitrogen fertilizer solutions and anhydrous ammonia for the period October 1 to December 31. During that period, the solutions will be priced at $1.14 per unit of contained nitrogen, with anhydrous ammonia at $75 per ton. On January 1 of next year the prices will be returned to $1.20 per unit and $80 per ton for ammonia.

•

Describe FMC Development

In an eight-page illustrated article in the Sept.-Oct. issue of the *Armed Forces Chemical Journal*, A. T. Loeffler, company vice president, describes the growth and development of the Food Machinery and Chemical Corp., New York. The article is one of a series in the *Journal* highlighting the role of chemical science and industry in National Defense.

The article describes the growth of the original John Bean Spray Co. into one of the nation's major chemical producers, and devotes particular attention to the corporation's Niagara Chemical, Fairfield Chemical, and Westvaco Mineral Products Divisions, all producers of agricultural chemicals. It describes Niagara as "a leading producer of agricultural insecticides and fungicides, industrial sulfurs and weed killers, and various types of dusters." It goes on to describe the company's major production plants at Middleport, N. Y.; Jacksonville, Fla.; Richmond, Calif.; Harlingen, Tex. and Belle Chasse, La.

Westvaco Mineral Products chief agricultural chemical product, phosphorus, is produced mainly from the phosphate shale deposits in the Far West, with elemental phosphorus being produced at conversion plants at Newark, Calif., Lawrence, Kan., and Carteret, N. J.

Mr. Loeffler then goes on to describe the founding of the Fairfield Chemical Division in 1954, when FMC acquired the National Distillers Products Corp. USI Fairfield plant at Baltimore. He describes Fairfield's pyrethrum, allethrin and piperonyl butoxide production facilities.

AS WE GO TO PRESS...

National Nitrogen Solutions Assn. Elects Crouse Pres.

THE National Nitrogen Solutions Association last month became the National Fertilizer Solutions Association, at its annual meeting in Sioux City, Iowa, Oct. 15-17. The more than 300 persons attending voted overwhelmingly for the name change, which will enable the association to include a group of liquid complete fertilizer producers.

E. E. Crouse, CDK Liquid Fertilizer Corp., Liberty, Ind., was elected president; Don Foster, Don Foster, Nitrogen Solutions, Ottawa, Ohio, vice president; William B. Parrish, secretary; and John White, Auburn Fertilizer Co., Auburn, Neb., treasurer.

"A dollar's worth of fertilizer today is worth almost two and one-half times as much to the farmer as it was in 1939," W. R. Allstetter, vice-president of the National Plant Food Institute, told the members in an address entitled "Production and Use of Fertilizer Nitrogen."

"Fertilizer properly used is a cost cutter," he said. "It is one of the really great bargains in agriculture today . . . This is a story we should tell over and over again. It is a story which has as yet not, I am afraid, gotten over to the farmer or for that matter, to many professional agricultural workers."

John D. Waugh, director of advertising, Nitrogen Division, Allied Chemical & Dye Corp., further pursued the theme of the values of education and advertising in selling the fertilizer product. He called for consistency in advertising, and stressed the value of repetition as a means of getting a brand name well known and recognized.

A. V. Slack, chief of the program development staff, Tennessee Valley Authority, pointed out low labor costs and use of less power as advantages in the production of liquid fertilizers. He also cited the low initial investment that is required to begin operations as a factor in the increase of such production units in the Southwest and Midwest.

Among other speakers were E. E. Crouse, Professor J. A. Stritzel, extension agronomist, Iowa State College, and Wayne R. Johnson, Johnson Bros. Mills, Inc., Shenandoah, Iowa.

At the close of the formal sessions, F. Todd Temblay, Washington Farmers Cooperative, Seattle, Ernest Harper, Nitrogen Division, Allied Chemical & Dye Corp., New York, and Donald Webber, Spraying Systems, Bellwood, Ill., were elected as new members on the association's board of directors.

•

Spencer Assigns 2 in Sales

The assignment of a new agricultural chemicals sales representative for Ohio and re-assignment of another from Mississippi to North Carolina has been announced by Spencer Chemical Co., Kansas City. William A. Sime, formerly at the company's offices in Kansas City, was named representative for Ohio, and Thomas L. Campbell was transferred from Mississippi to North Carolina.

•

25 Years at Rutgers

Dr. Bailey B. Pepper, chairman of the Entomology Dept. of the Agricultural Experiment Station, Rutgers University, New Brunswick, N. J., is pictured unwrapping one of the gifts he received from his colleagues at the celebration of his 25th anniversary at Rutgers. Nearly 100 members of the department, graduate students, and former students attended the celebration, which was held Oct. 10 at the Forsgate Country Club, Jamesburg, N. J. In the photo are Mrs. Pepper, Dr. Pepper, and Dr. Ordway Starnes, associate director of the experiment station.

NE Conf. Issues Report Call

The Research Coordinating Committee of the Northeastern Weed Control conference last month began a survey on the performance of materials and practices in the various phases of weed control. Results of the survey, which is based on information obtained from experiment stations and industrial personnel actively engaged in weed work in the Northeast, will be published in the 1957 Supplement to the Conference Proceedings.

•

Phytopathological Meeting

The 48th annual meeting of the American Phytopathological Society will be held in conjunction with The Potato Association of America Dec. 5-8 at the Netherland-Hilton Hotel, Cincinnati, Ohio.

•

Beltwide Cotton Conference

DISCUSSIONS on recent developments in research on cotton insects and diseases will highlight the second annual Beltwide Cotton Production Conference Dec. 13-14 at the Hotel Titwiler, Birmingham, Ala. General chairman for the program will be J. D. Hays, vice-president, Alabama Farm Bureau Federation, Huntsville, Ala.

The program will include a symposium on "What's New in Controlling Cotton Insects," led by W. A. Ruffin, extension entomologist, Alabama Polytechnic Institute, Auburn, Ala. Dr. Dial F. Martin, Dept. of Entomology, Texas A & M College, will discuss "Conventional Chem-

icals"; K. P. Ewing, head of the Cotton Insects Section, Entomology Research Branch, USDA, "Systemics"; Dr. T. F. Leigh, Dept. of Entomology, University of Arkansas College of Agriculture, "Cultural Methods and Timing"; and E. Buford Williamson, Delta Branch Experiment Station, Stoneville, Mississippi, will discuss "Application Methods."

The problems of specific cotton insects and resistance will share a portion of the program. Dr. L. D. Newsom, head of entomology research, Louisiana State University, will speak on "Cotton Resistance to Chemicals"; Dr. E. F. Knipling, chief, Entomology Research Branch, USDA, "Basic Research for Control of Insects Tomorrow"; Claude L. Welsh, director Division of Production & Marketing, National Cotton Council, Memphis, "Progress and Problems in Cooperative Pink Bollworm Research"; and Dr. Eldon J. Cairns, Dept. of Botany and Plant Pathology, Alabama Polytechnic Institute, Auburn, Alabama, "Recent Developments to Cope with the Nematode Menace to Cotton."

•

Aviation Assn. To Meet

A number of air applicator conferences will highlight the 17th annual meeting of the National Aviation Trades Association at the Chase Hotel, St. Louis, Nov. 1-3. The conferences will review the Civil Aeronautics Administration's proposal for an "Air Agency," "Safety with Phosphate Insecticides," and a presentation on cost analysis.

On Nov. 2 a round table will be held on the subject of Federal applicator contracts, and will include representatives of the USDA and the CAA.

•

Associated Names Northrop

Ray Northrop has been named manager of the Agricultural Chemicals Division of Associated Sales & Supply Co., St. Louis. Formerly associated with Planetary Chemicals, he had been assistant sales manager in Associated's agricultural chemicals department since February of this year.

Fischer Joins Ninol

Ellias Fischer, formerly of Armour & Co., has joined the technical staff of Ninol Laboratories, Chicago, and will head development work in the field of agricultural emulsifiers. In making the announcement, Ninol reported that it is expanding its "Toximul" line of specialized emulsifiers for insecticide and herbicide formulations to cover the entire range of commercial pesticides.

•

Predict Industry Growth

Marlin G. Geiger, executive vice-president in charge of the Chemical Group of W. R. Grace & Co., New York, predicted, at a luncheon meeting of the Round Table for Business Executives, at the New School for Social Research Oct. 25, that the chemical industry will soon be growing "four, possibly five times as fast" as the average of the rest of industry.

Admiting that much of the responsibility for the nation's farm surpluses rests squarely on the shoulders of the agricultural chemicals industry, Mr. Geiger explained that "radically improved fertilizers have made it possible to raise more crops on the same, or even less, acreage. Our insecticides have protected those crops and made it possible for them to reach temporarily glutted markets. Many new and improved agricultural chemicals are now either in the advanced laboratory stage or practically ready for the market. They will make it possible to increase production still further."

He explained that our population is growing at the rate of about 2½ million people per year; 95% of our tillable land is already cultivated; and industry is taking an increasingly large proportion of farm products each year.

•

Dr. T. H. Kearney Dies

Dr. Thomas H. Kearney, botanist and cotton expert, died late last month in San Francisco. He spent fifty years with the USDA in Washington, becoming chief physiologist. At the time of his death he was honorary curator and a research associate with the California Academy of Scientists.

•

IMCC To Build New Hdq.

International Minerals & Chemical Corp., Chicago, announced that it will build new general headquarters in Skokie, Ill., to better accomodate its expanded activities. The announcement, made at a special press conference in New York Oct. 23, reported that construction will begin early in 1957, with completion scheduled for mid 1958.

As presently planned, the new facility will cost approximately $3.5 million, and will be financed by a sale and leaseback arrangement. It will consist of three main buildings, including a five-story structure housing the corporate administrative offices. A second, three-story building will house staff and operating divisions. Total floor area will be approximately 120,000 square feet. The company's Central Research Laboratory already occupies part of the site.

•

Taste Symposium Scheduled

A series of symposia on flavor research will be inaugurated Nov. 19 at the Flavor Laboratory of Arthur D. Little, Inc., Cambridge, Mass. The first symposium will present a broad picture of the current state of flavor research and its industrial application.

•

J. Headley Fellowship Meeting

The advisory council of the Thomas J. Headlee Fellowship in Entomology held its 12th annual meeting at Rutgers University on Oct. 26.

Thomas M. Stevens and Fred C. Swift, current Headlee fellows submitted reports of their work to the group. Dr. Andrew J. Forgash, Rutgers entomologist and former Headlee fellow, summarized the work.

Represented on the council are some 30 firms and individuals who have contributed more than $40,000 to the Headlee fund, devoted to fundamental research in entomology.

NEWS Brevities

RE-MARK CHEMICAL COMPANY, Goulds, Fla., has announced plans for a $100,000 expansion of its recently-acquired fertilizer plant at Goulds.

AC

L. GORDON BYWATER was recently appointed superintendent of the anhydrous ammonia plant currently under construction at U. S. Steel's Geneva Works, Provo, Utah.

AC

ASSOCIATED METALS AND MINERALS CORP., New York, has appointed Emanuel Sonnenschein to take charge of its chemical and fertilizer department.

AC

DORR-OLIVER, INC., Stamford, Conn., appointed Chemical Pump and Equipment Corp. of New York City as its exclusive sales representative for chemical and industrial pumps in the greater New York metropolitan area.

AC

NORMAN H. YOUNG has been appointed plant manager of the Chatham, Ont., plant of Ontario Plant Foods Ltd. He is secretary-treasurer of the company.

AC

CO-OPERATIVE GRANGE LEAGUE FEDERATION EXCHANGE, INC., Syracuse, reported a figure of $163 million in total business for the fiscal year ending 30 June, with a net profit before taxes of $4,354,000. The announcement was made at the stockholders annual meeting in Syracuse Oct. 18.

AC

ROBERT B. STEWART has been appointed an assistant professor in the Department of Plant Physiology and Pathology at the A&M College of Texas, and will investigate forage crop diseases.

RICHARD G. HARTMAN has been appointed sales representative for the Zonolite Co., Chicago, and will cover the territory of southwestern Ohio, southwestern West Virginia, eastern Kentucky, and several counties in southern Indiana. He joined the company in 1949.

AC

MINERALS & CHEMICALS CORP. OF AMERICA, Menlo Park, N. J., last month announced the assignment of Joseph R. Meehan to the agricultural chemicals department. He will handle sales and service activities in connection with "Attaclay" and "Granular Attaclay," the company's pesticide carrier and diluent.

AC

JOHN TUITE, a phytopathologist, recently joined the staff of the Department of Botany and Plant Pathology, Purdue University, to conduct research on diseases of forage crops.

AC

HERCULES POWDER CO., Wilmington, Del., has announced that an investigation of new fungicidal chemicals will be undertaken by Dr. Eugene N. Pelletier.

AC

THE WISCONSIN ALUMNI RESEARCH FOUNDATION announced recently that Ward Ross, managing director, had moved to the Madison, Wisc. office of the foundation at 506 North Walnut Street.

AC

KENTUCKY DISTRIBUTORS, INC. was recently incorporated at Paris, Ky., to deal in the manufacture and sale of agricultural chemicals.

AC

TWO NEW ACCOUNT EXECUTIVES and a copy man to the Agricultural Division of Klau-Van Pietersom-Dunlap, Inc., Milwaukee, was announced recently. Robert D. Nord and John D. Finley were appointed account executives, and Karl F. Ohm a copywriter. Charles Calkins, formerly with the division's creative staff, was also made an account executive.

AC

AMERICAN CYANAMID CO., New York, announce a consolidation and relocation of the Detroit sales branch offices. The Industrial Chemicals, Fine Chemicals, and Plastics and Resins Divisions' branch sales offices will be moved to a new location at 10115, West McNichols Road.

AC

GEORGE B. SIMONS has been appointed by the Fertilizer Division of Balfour, Guthrie & Co., Ltd., San Francisco, as field supervisor for North Dakota and Western Minnesota. He had been in the North Dakota Extension Service.

AC

WILLIAM Q. HARNED, secretary-treasurer of the Federal Chemical Co., Louisville, Ky. died recently. He had been with the company for 40 years.

AC

CANADIAN INDUSTRIES LIMITED has purchased Witts Fertilizer Works Limited, manufacturers of compound fertilizers.

AC

HAROLD A. FORD has joined the Industrial Chemicals Division of Olin Mathieson Chemical Corporation, Baltimore, Md. as assistant manager of nitrogen products. He was formerly sales representative in the Kansas City area for Westvaco Chlor-Alkali Division of Food Machinery & Chemical Corporation.

AC

THREE TECHNICAL REPRESENTATIVES have been assigned to district offices of Carbide and Carbon Chemicals Company. They are W. H. Whyman to the Buffalo District; T. M. Fulton to the Kansas City District; and C. S. Mitch to the St. Louis District.

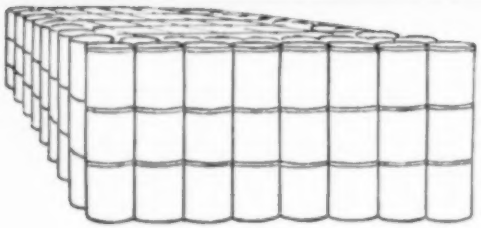
AC

DELTA AMMONIA CO. was granted a charter of incorporation last month at Clarksdale, Miss. It listed capital stock of $15,000.

Use Fulton **WPPL*** Bags... store empties in less than 2½% of the space required by rigid containers!

*WATER-PROOF PAPER LINED

By: A. W. Moenkhaus
Sales Manager, Bag Division
Fulton Bag & Cotton Mills
St. Louis, Mo.



Empty Rigid Containers
—Capacity 25,000 lbs.

Empty Fulton WPPL Bags
—Capacity 25,000 lbs.

• It takes approximately 480 cubic feet of warehouse space to store enough empty rigid containers to hold 25,000 pounds of chemical fertilizer. But it takes only 11⅓ cubic feet to store one bale of Fulton's WPPL (Water-Proof Paper Lined) Bags. And this single bale holds 250 of the 100-pound bags—enough to ship 25,000 pounds of the same material.

• For complete, low-cost protection of your chemical products, always specify Fulton WPPL bags. You have your choice of styles—economical burlap or cotton laminated to a selection of papers or polyethylene (which is acid and alkaline resistant). If you have an unusual packaging problem, we'll find a Fulton bag to fit your needs . . . or we'll design one!

Why pay more? Fulton WPPL bags feature:

- Protection against moisture, both in transit and storage.
- Easiest handling, most economical storage.
- Lowest possible cost.

WRITE TODAY

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FULTON BAG & COTTON MILLS
1408 Annunciation St., New Orleans, La.

We have a problem in packing _____

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NAME _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____

Let us help you solve your packaging problem

Fulton
BAG & COTTON MILLS

ATLANTA • CHICAGO • DALLAS • DENVER • KANSAS CITY
LOS ANGELES • MINNEAPOLIS • NEW ORLEANS • NEW YORK
OKLAHOMA CITY • PHOENIX • ST. LOUIS • SAN FRANCISCO
SAVANNAH • WINTER HAVEN

THE INDUSTRIAL TRUCK DIVISION of Clark Equipment Co., Battle Creek, Mich., has announced the opening of a factory sales branch at 625 N. Kedzie Ave., Chicago, to service Lake and Cook counties. At the same time the division announced that Cromer Industrial Equipment, Inc., Aurora, Ill., Artim Equipment Co., Hammond, Ind., and Geraghty Industrial Equipment, Inc., Rockford, Ill., will handle various counties in the two states.

AC

JAMES WIRWILLE has been named by Velsicol Chemical Corp., Chicago, as agricultural chemical sales representative for a Southeast area including Virginia, the Carolinas, and Burke and Richmond Counties in Georgia. His headquarters will be in Columbia, S. C.

AC

THE CALIFORNIA SPRAY CHEMICAL CORP., Richmond, Calif., recently announced plans to build new warehouses at Wellton and Casa Grande, Arizona. The Casa Grande project will cost $50,000 and the one at Wellton $35,000.

AC

BRUCE L. HADDOCK was recently named assistant merchandising manager of Diamond Black Leaf Co., Cleveland, manufacturers and marketers of pesticides.

AC

JAMES H. JONES has joined Carbide and Carbon Chemicals Co., New York, a division of Union Carbide and Carbon, Corp., as a technical representative with the Crag Agricultural Chemicals Division.

AC

RICHARD G. POWELL, has been named director of technical services for Mississippi River Chemical Company. a division of Mississippi River Fuel Corp., St. Louis. Mo. He was formerly technical service representative.

AC

HUGH E. THOMPSON, entomologist with the Pennsylvania State Dept. of Agriculture, was recently appointed assistant professor of entomology in the agricultural experiment station at Kansas State College, Manhattan, Kan. He had been studying the relationships between oak wilt disease and insects, and between the Dutch elm disease and elm bark beetles; and will continue similar studies at K-State.

AC

ARKELL & SMITHS have purchased the bag-making equipment of the Thomas Phillips Co., Akron, Ohio, and have also leased the Thomas Phillips bag factory. Arkell & Smiths will operate this plant in addition to their four bag plants at Wellsburg, W. Va.; Mobile, Ala.; and Canajoharie and Hudson Falls, N. Y.

AC

DAVID HOWE, of Dallas, Texas, has joined the research development and engineering staff of Commercial Solvents Corp., New York, as agronomist. Dr. Howe will make his headquarters at CSC's Research Laboratories at Terre Haute, Indiana.

Equipment AND BULLETINS

Du Pont Chlordane Package

A new squeeze-duster package of chlordane, for one-hand operation indoors and out, was announced by the Du Pont Co., Wilmington, Del., at

the National Hardware Show in New York early last month. The product is a 6% chlordane formulation, recommended for control of such indoor insects as ants, roaches, waterbugs, silverfish, crickets and spiders. Outdoors it controls Japanese beetle grubs, cutworms, armyworms, centipedes, and many other insects.

A directional nozzle makes possible the spraying of baseboards, windown and door frames, and insect runways. The chlordane container is the fifth squeeze-duster in Du Pont's new line. The other four, announced last year, are Rose Insecticide and Fungicide, Tomato Dust, Floral Dust, and Vegetable Garden Dust.

•

"Wonsover" Folder

The Norton-Portland Corp., Portland, Maine, has just issued a new illustrated folder describing its "Wonsover Model 96." The 12-ton giant, described as "the greatest agricultural advance since the reaper" automatically clears stubble, plows, harrows, levels, limes, fertilizes, sprays, subsoils, and seeds in one operation. In addition to a complete diagram illustrating its operation, the folder gives specifications and depicts each of the important equipment parts of the Wonsover.

•

New Hose Type Developed

A new hose to dispense liquid fertilizer from farm storage tanks has been developed by Hewitt-Robins Inc., Stamford, Conn. It's chief feature is a synthetic rubber lining resistant to ammonia nitrate solutions and petroleum products, and a green neoprene outer covering resistant to sunlight and oxidation.

New Gen. Amer. Booklet

The General American Transportation Corp., Chicago, has just issued a new 27-page illustrated booklet listing and describing its various services and equipment. The company is a leading leaser of special railway tank and bulk-equipment cars, operating more than 48,000 cars throughout the country.

Among the types of equipment illustrated are general service tank cars, cars with specialized linings and fittings, tank cars of special corrosive resistant materials, and pressure cars for anhydrous ammonia and other liquid fertilizers. The booklet also describes the General American "Airslide" cars, gravity-loaded cars that are used for bulk shipment of phosphatic clay and other dry granular and powdered materials.

Other types of agricultural chemical equipment listed and illustrated include turbo-mixers, rotary steam tube dryers, welded tanks, and the Wiggins storage tanks. "Kanigen" corrosion-resistant coatings are also included, in addition to various products of the company's plastics division.

Insecticide in New Package

"Antrol Multi-Purpose Dust" an all-purpose insecticide for home garden use, was recently placed on the national market by Boyle Midway, Inc. In a special "Bracon" polyethylene container made by Bradley Container Corp., Maynard, Mass., a subsidiary of Olin Mathieson Chemical Corp., the powder is recommended for use against such pests as Japanese beetles, aphids, azalea scale, thrips, tent caterpillars, spider mites, and other garden insects.

The can delivers a fine spray at a light squeeze of the fingers. Just below the recessed orifice is the essential mixing chamber. The fine spray is created by the polyethylene dispenser plug which friction fits into the top of the container. There is also a large diameter removable snap-in closure in the bottom permitting easy refilling.

New "Antrol" dust spray being applied against rose bush insects

Carbide Issues Booklet

More than 335 organic chemicals are described in a new 24-page booklet just issued by Carbide and Carbon Chemicals Co., New York, a Division of Union Carbide and Carbon Corp. Condensed data on applications are presented and physical properties are given in tabular form. An alphabetical index is included also.

The 1957 edition of "Physical Properties of Carbide and Carbon Chemicals" features twenty-one new products. "Sorbic," a fungistat for foods, and "Niatex antistatic AG-2" are two of the new products described in the section on chemicals for special applications. For reference, other chemicals are arranged by family groups.

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Vapam Booklet Ready

An eight-page illustrated brochure describing how soil fumigation increases yields of many crops, has just been published by Stauffer Chemical Company, New York. The new publication emphasizes that malnutrition and drought have often been blamed for crop failure whereas root and seed-attacking fungi and nematodes were the real culprits. Recent research has established that such soilborne pests, and weeds, often rob growers of a full tenth of their crops.

The brochure outlines simple methods of fumigating the soil by applying Stauffer's temporary soil sterilant, "Vapam." It points out that extensive field tests have proved the effectiveness of the various application methods — any of which may be used—sprinkling can, hose proportioner, sprinkler, deep injection, shallow injection, plow sole application, flood irrigation or sprayer.

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Clark Producing Diesels

Clark Equipment Co., Benton Harbor, Mich., recently announced General Motors diesel engines as optional power plants on two models of its Michigan tractor shovel line. The Michigan 175A has been made available with a Detroit Diesel Engine Division model 4-71 engine, and a Detroit Diesel model 3-71 is being offered in the Michigan 125A tractor shovel.

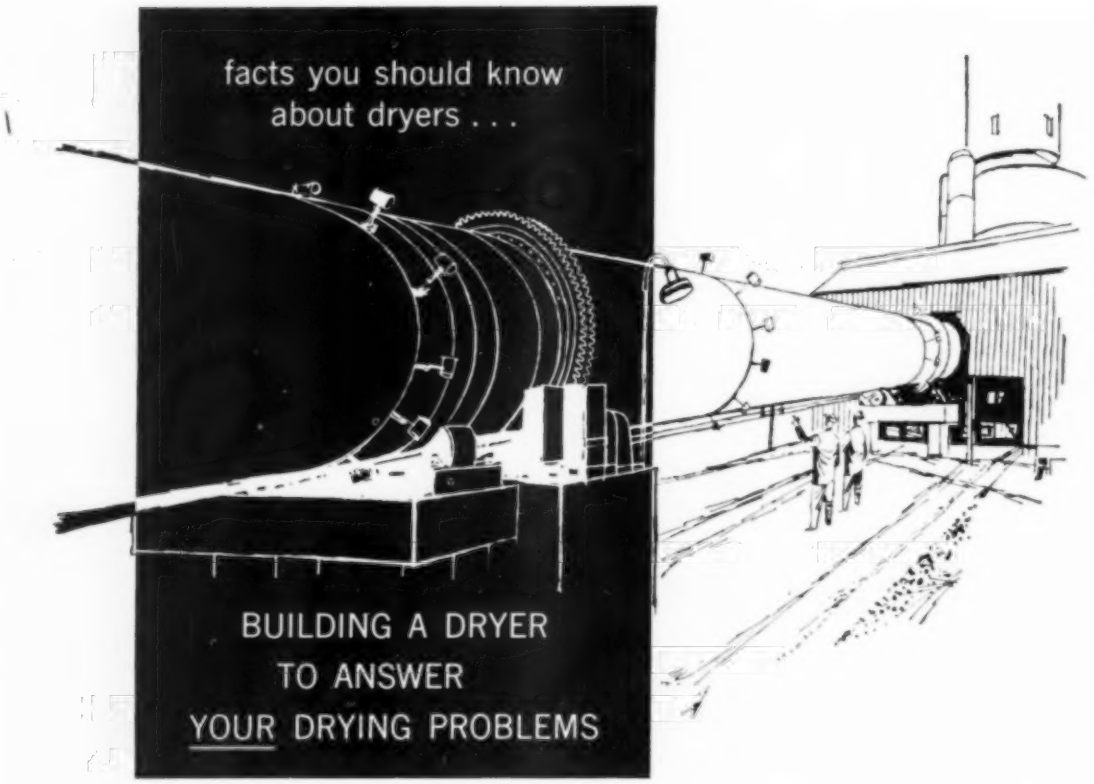
Dry Grinding Mill Catalogue

Hardinge Company, Inc., York, Pa., has just published a 44-page catalog on its line of mills for dry grinding and pulverizing, "Bulletin 17-C." The catalog discusses the correct application and selection of conical, tricone, cascade, rod, tube and disc roll mills for dry grinding problems. It describes also various air classifying arrangements and shows a number of plant flow sheets. Mill auxiliaries, such as feeders and electronic controls, are described also. Complete specifications for a number of Hardinge dry grinding mills are given, with detailed grinding performance data for a large variety of materials.

•

F&B Price List Issued

Faesy & Besthoff, Inc., New York, has just published the 1957 price list for its line of garden and home agricultural chemicals. The list, now covering 26 products, gives a description of each, including methods of packaging, and dealer and suggested consumer prices.



For over 55 years, Louisville Dryers have been solving industry's drying problems and effecting marked economies. The following is intended as an introduction to selecting the right type of dryer.

Q. *Since my required production capacity indicates a continuous dryer will give lowest drying cost, which design is best for my purpose?*

A. Assuming the material is in bulk form, a rotary type dryer is best for your purpose. It is almost axiomatic that materials suited to drying in rotary dryers are dried at lowest *overall* cost in that type.

Q. *If I consider a rotary dryer, should it use high temperature furnace gases or low temperature warm air to dry my material?*

A. This will depend on your particular material, for instance—

1. The temperature to which it can be heated without injury.
2. The amount of moisture in the wet material.
3. The material temperature necessary to dry the material to the desired final moisture content.
4. Whether or not the material will be contaminated by contact with combustion gases.

Q. *I think my material will not be injured by gases from an oil furnace. Should I use a parallel or counter current rotary dryer?*

A. This will depend on a number of considerations, such as:—

1. Is the material flammable?
2. How dry must the product be?
3. Is the dried product dusty or is it granular with very small percentage of "fines?"
4. Will "case hardening" occur in high temperature atmosphere inhibiting uniform and complete drying of large lumps and particles?

Q. *There seems to be quite a number of conditions affecting the selection of the proper dryer type.*

A. Very true. And the conditions involved are not all included in the above discussion by any means.

Q. *How can I be sure of making the proper choice?*

A. An experienced drying engineer knows how to evaluate the various conditions involved in each drying problem and will make a sensible recommendation. If advisable he will also recommend pilot plant tests to confirm his conclusions.

Q. *How can I obtain such advice?*

A. Submit your problem to General American. An analysis and recommendation by a LOUISVILLE engineer entails no obligation on your part.

PROCESS EQUIPMENT DIVISION GENERAL AMERICAN TRADE MARK

LOUISVILLE DRYING MACHINERY UNIT

GENERAL AMERICAN TRANSPORTATION CORPORATION

Dryer General Sales Office: 139 So. Fourth Street, Louisville 2, Kentucky
Eastern Sales Office: 380 Madison Avenue, New York 17, New York
In Canada: Canadian Locomotive Company, Ltd., Kingston, Ontario, Canada
General Offices: 135 S. La Salle Street, Chicago 90, Illinois

MEETING CALENDAR

Nov. 1-3—National Aviation Trades Assn., Air Applicator Conferences, Chase Hotel, St. Louis, Mo.

Nov. 2 — First Annual Southern Soil Fertility Conference, Atlanta Biltmore Hotel, Atlanta, Georgia.

Nov. 2—Fertilizer Industry Work Conference, Atlanta-Biltmore Hotel, Atlanta

Nov. 7-9 — Agricultural Ammonia Institute, Atlanta Biltmore Hotel, Atlanta, Ga.

Nov. 7-9 — Pacific Northwest Plant Food Association, Harrison Hot Springs Hotel, British Columbia.

Nov. 11-13—California Fertilizer Association, Coronado Hotel, Coronado, Calif.

Nov. 13-15 — New York State Insecticide and Fungicide Conference, 18th Annual Meeting, and Pesticide Application Equipment Conference, 9th annual meeting, Bibbins Hall, Cornell U., Ithaca, N. Y.

Nov. 18-20—Midwest Garden Show, Navy Pier, Chicago.

Nov. 19-20 — Ohio Pesticide Institute, Neal House, Columbus, Ohio.

Nov. 19-20 — Entomological Society of America, Eastern Branch, Hotel Haddon Hall, Atlantic City, N. J.

Nov. 27-28—Indiana Fertilizer Conference, Memorial Union Building, Purdue Univ., Lafayette, Ind.

Dec. 3-5 — Chemical Specialties Manufacturers Association, Mayflower Hotel, Washington, D. C.

Dec. 6-8 — American Phytopathological Society, Netherland Hilton Hotel, Cincinnati, Ohio.

Dec. 9-12 — National Meeting of American Society of Agricultural Engineers, Edgewater Beach Hotel, Chicago, Ill.

Dec. 10-12 — North Central Weed Control Conference, Sherman Hotel, Chicago.

Dec. 12 — American Society of Agricultural Engineers, Edgewater Beach Hotel, Chicago.

Dec. 13-14—Beltwide Cotton Production Conference, Dinkler-Tutwiler Hotel, Birmingham, Ala.

Dec. 26-31 — American Association for the Advancement of Science, New York City.

Dec. 27-31 — Entomological Society of America, national meeting, Hotel New Yorker, New York City.

Jan. 9-10—Wisconsin Insect Control Conference, the Loraine Hotel, Madison, Wisc.

Jan. 10-12 — Northeastern Weed Control Conference, Sheraton-McAlpin Hotel, New York.

Jan. 13-15 — Garden Supply Show, Kingsbridge Armory, New York.

Jan. 13-15—Weed Society of America, Peabody Hotel, Memphis, Tenn.

Jan. 21-25—Pacific Northwest Vegetable Insect Conference, and Northwest Cooperative Spray Project, Imperial Hotel, Portland, Ore.

Jan. 22-24 — California Weed Conference, Fresno Memorial Auditorium, Fresno, Calif.

Jan. 23-25 — Southern Weed Conf., Bon Aire Hotel, Augusta, Georgia.

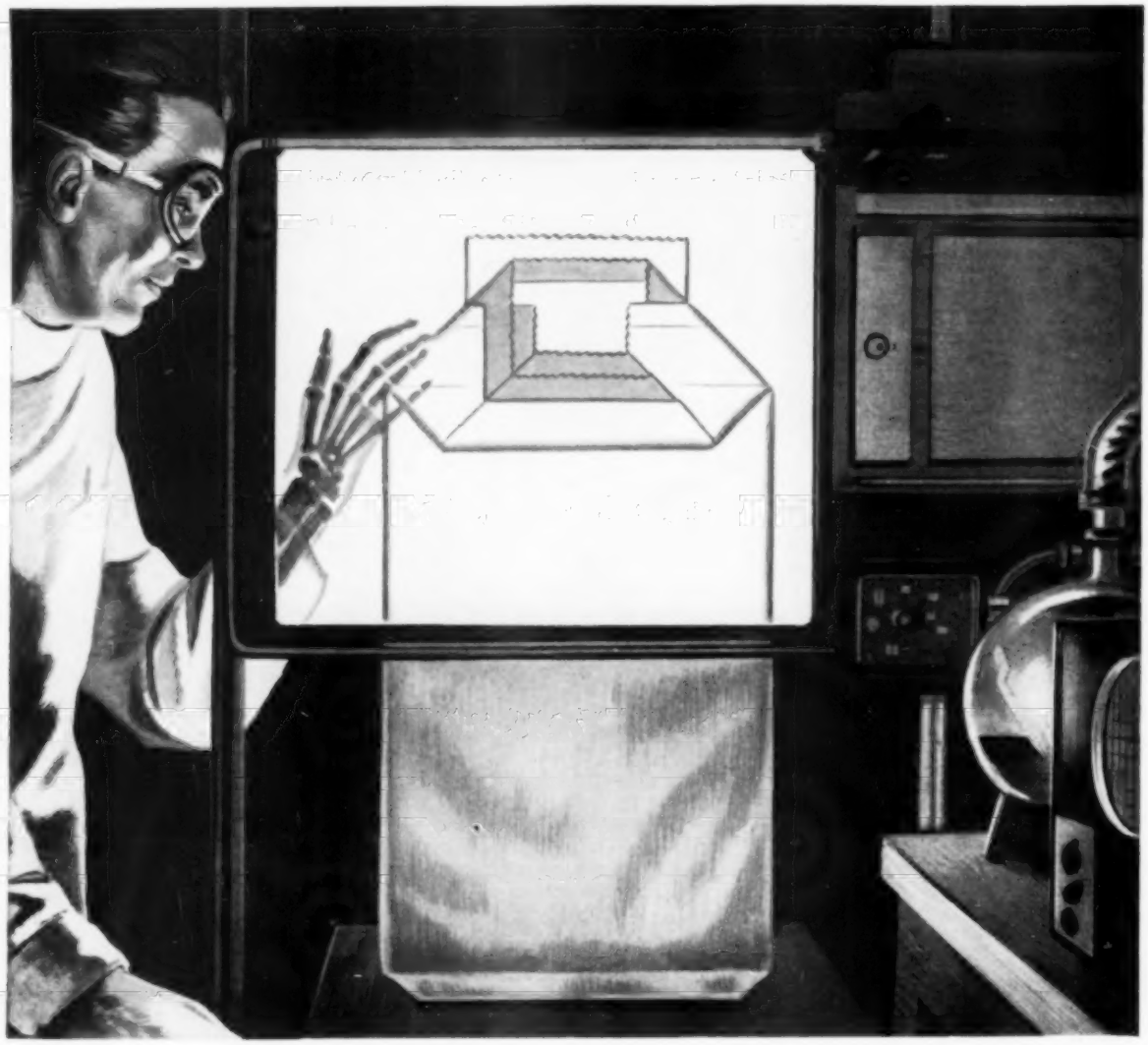
Jan. 23-25—Pacific Northwest Agricultural Chemicals Industry, Benson Hotel, Portland, Ore.

Feb. 19-20—Alabama Pest Control Conference, and Alabama Association for Control of Economic Pests, Auburn, Alabama.

Mar. 27-29 — North Central Branch, Entomological Society of America, 12th annual meeting, Des Moines, Iowa.

June 17-19 — Association of Southern Feed and Fertilizer Control Officials, 15th annual convention, Dinkler-Tutwiler Hotel, Birmingham, Alabama.

Things you can't see count too!



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Brevities

R. L. LOGAN was recently appointed manager of the Niagara Falls electrochemical plant of the Potash Division of International Minerals & Chemical Corp., Chicago. He had been assistant manager of the plant since Nov., 1952.

AC

THE GREEK MINISTRY OF COORDINATION, at Athens last month announced a closing date for submission of bids for construction of a $30 million nitrate fertilizer plant at Ptolemais. No bids will be accepted after Jan. 14, 1957.

AC

H. W. DU VAL, formerly with Dow Chemical Co., Midland, Mich., has joined Reichhold Chemicals, Inc., as eastern sales manager of the chemicals division.

AC

THE REAL-KILL CO., Kansas City, manufacturer of household insecticides, has appointed Roger M. Kirk, Jr. vice president and director of sales, promotion, and advertising. He had been with the Dromedary Co., a food concern.

AC

JACK LOMAX, an entomologist, has joined the Western division staff of the Velsicol Chemical Corp., Chicago. He will work on the West Coast, handling technical problems and contacts with colleges and experiment stations. Prior to joining Velsicol, he was with the Imperial Valley Cotton Oil Co. and Geigy Agricultural Chemicals.

AC

SARATOGA FARM CHEMICALS, INC., Saratoga Springs, N.Y., has filed articles with the secretary of state at Albany to change its name to Greenfield Spray Dryers, Inc.

AC

DESOTO CHEMICAL AND SUPPLY CO., Hernando, Miss., was granted a charter of incorporation to deal in fertilizers, petroleum products, and machinery. Capital stock of $100,000 was listed.

AC

DON C. FORCE recently joined the Agricultural Laboratory, Mountainview, Calif. of the Stauffer Chemical Co., New York, as an entomologist. He had been a laboratory assistant in the Department of Entomology at the University of California at Davis.

AC

DR. R. W. STAROSTKA recently joined the Department of Agricultural Research of the Davison Chemical Co., Division of W. R. Grace & Co., Baltimore. He had been soil scientist with the Fertilizer and Agricultural Lime Section, USDA, Beltsville, Md.

AC

ANDERSON W. WEAVER, founder and chairman of the board of the Weaver Fertilizer Co., South Money Point, Va., died recently. Prior to his founding the Weaver Co. in 1929, he had been district manager of the Armour Fertilizer Works.

AC

DARLING & CO., Monsanto, Ill., manufacturers of commercial fertilizers, were hit last month by a strike of the United Mine Workers union. Maintenance workers, belonging to another union, have refused to cross the picket line.

AC

Telone Soil Fumigant

Telone, Dow's soil fumigant, is recommended as a general nematocide, especially where meadow and cyst-forming nematodes (such as sugar beet and golden) are a problem. Where it is obvious that sting, tobacco stunt (stylet) and potato rot nematodes predominate, Dowfume W-85 (containing ethylene dibromide) is preferred. A wide variety of crops can be treated with Telone, and it is especially useful for citrus replanting areas, cotton, floral crops, nursery crops, pineapples, tobacco, and vegetables of all kinds, including onions in sandy or muck soils.

Telone will be the first commercially available soil fumigant composed of undiluted technical dichloropropenes. It is one of the most effective nematocides for the control of root knot nematodes, lesion or meadow nematodes, cyst formers, and many other species. As an insecticide Telone is not very effective. *Down To Earth*, 12, No. 2, 1956.

Bemis Appoints Kindseth

H. V. Kindseth, until recently in charge of the company's department of physical research in Minneapolis, has been appointed director of research for the Bemis Bro. Bag Co., St. Louis. He will assume the research responsibility of Daniel Belcher, vice-president and director, who recently announced his forthcoming retirement.

Mr. Kindseth joined Bemis in 1931, and worked on development of the bag packing machinery and equipment produced by the company's packaging service plant in Minneapolis. In 1948 he was appointed chief engineer for packaging service, and in 1952 became supervisor of the Minneapolis research unit.

■

Spraying Techniques

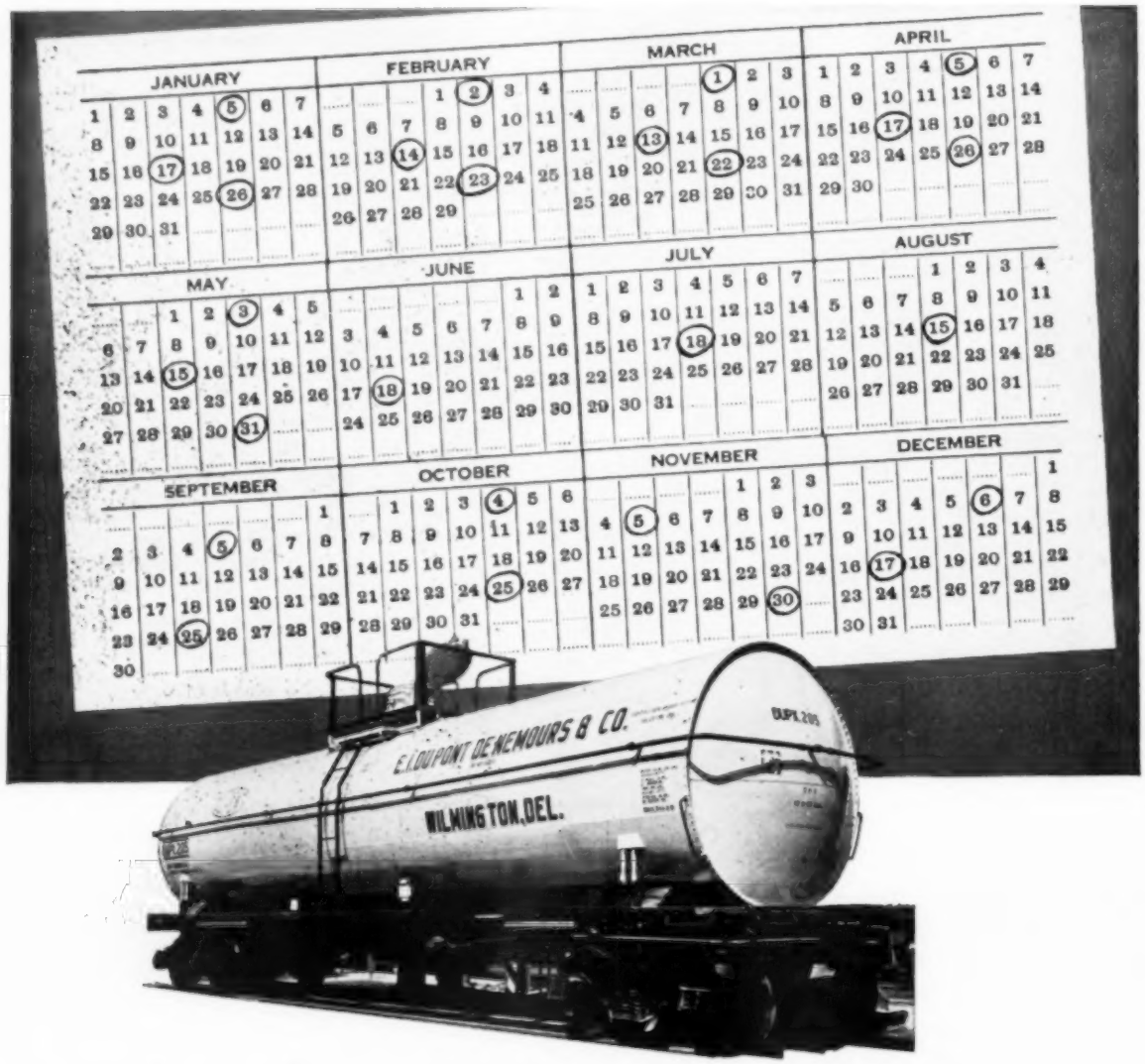
H. E. Bramston-Cook, vice-president of Oronite Chemical Co., New York, declared that early application of the first treatment of aerial insecticides and parasiticidal fogs is essential to get adequate control. He advocates these sprays before the buds break out, though when application is made by use of oil emulsions, he warns that it is not possible to proceed until the danger of late frost has passed and until water is present in the irrigation ditches.

He also advises the possibility of applying an electrostatic charge to the particles of oil and/or active chemical (with direction of the charged fog toward the naked trees) as a means of obtaining complete coverage without much loss of material.

■

IMCC Earnings Rise

The International Minerals & Chemicals Corp., Chicago, announced at its stockholders meeting in New York Oct. 23 that net sales for the first quarter of the current fiscal year were up 15.6% over the same period for last year. Sales for the three months ending Sept. 30 amounted to $18,477,000, as compared with $15,988,000 in the first quarter last year. Earnings for the same period were $614,000 against a loss of $860,000 in 1955 as a result of a strike in Florida.



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J. GIBBS PONDER, former sales manager of the Atlantic division of Armour Fertilizer Co., died Sept. 17.

ROUND TABLE

(*From Page 41*)

lass Co. Opening the session, Mr. Leister observed that the drying of granular fertilizer involves two simultaneous processes: evaporation at or near the surface of the granules; and diffusion of the moisture to the surface of evaporation. Evaporation or drying, he said, will therefore be limited by the rate at which the moisture can diffuse to the surface. With a diminishing water content, the rate of diffusion, and hence also rate of evaporation is slowed down. Mr. Leister presented a "short course" on drying and drying principles, and discussed several features of parallel low drying and counter current drying. He described also the equipment of Edw. Renneburg & Sons, with particular reference to the Dehydro-Mat Dryer and Cooler.

Reporting on the advantages of parallel flow drying, F. T. Niellson indicated this method of drying offers a greater guarantee against overheating, and freedom from over agglomeration because of case-hardening, and fairly dry exhaust gases . . . as compared with counter-current flow. One of the disadvantages of parallel flow drying, on the other hand, he said, is a less efficient drying and lack of agglomeration.

"The fertilizer industry, generally is a large volume producer of low cost material, — and therefore it is essential that processing and equipment costs be kept low." Mr. Neillson pointed out that the most expensive ingredient in the fertilizer formula is nitrogen, and that the cheaper forms of nitrogen have poor physical condition in that they tend to absorb moisture from the air, resulting in caked products. His discussion of raw materials introduced the basis for some of the principles to be considered in selection of drying and cooling equipment.

In connection with new equipment for granulation and ammoniation of fertilizers, Fertilizer Industry Round Table attendants were particularly interested in a review of the Sackett "Star Granulator," which was described by A. Spillman, Fertilizer Manufacturing Cooperative Inc., where the first "Star" was installed this past May. Comments by Mr. Spillman will be reviewed in Part 2 of the *Agricultural Chemicals* account of this 1956 Round Table.

Part 2 will also review comments on the symposium on bags and bagging; reports on sampling fertilizers and quality control; instrumentation; dust and fume control — and corresponding equipment; the Dorr Ammonium Phosphate Process; and the Davison Trenton Granulation Process.

(*Part 2 Next Month*)

CACA MEETING

(*From Page 57*)

fied and synthesized, may prove to be effective insecticides.

The reasons why the diets of certain insects are so often limited to a single variety of crop plant are hardly known. A deeper knowledge of the nutritional requirements of insects may provide leads to insecticides which will be active specificially against these pests. For example, the larvae of the beet eel worm may be stimulated by the diffusate of beet roots to emerge from the cysts. In the Netherlands, Hijner planted the wild beet, *Beta patellaris*, in soil heavily infested with the sugar beet nematode. In five months, a reduction of 90% was produced in the content of viable eelworm cysts in that soil.

Because fungi produce phytotoxic substances, it may be possible to take advantage of this fact to help prevent damage to crop plants, many researchers believe. Thus, instead of using fungicides which attack the pathogen, the approach would rather be the use of chemicals which act against the toxins,—the principle of "antidoting the toxin." Work is progressing along these lines, Dr. Martin reported, and public attention has recently been directed to the extraordinary effects on plant growth of gibberelin, the toxin produced by the fungus responsible for the "Baka-

nae (foolish seedling) disease of rice.

In addition to their use in the control of plant diseases, antibiotics are now being investigated for insecticidal applications as well. An insecticidal antibiotic has been discovered by Hannay of the London Laboratory. *Bacillus thuringiensis* is now used in California for the biological control of the alfalfa caterpillar.

There is currently a strong feeling of pessimism among entomologists, Dr. Martin indicated, as to the future of chemical methods of crop protection: first, because of the high cost to growers; second, because of the non-selective action of pesticides (their use against one pest may produce other more serious infestations); and third, because the use of pesticides results in the selection of pests or pathogens resistant to the pesticide.

"The objection of cost," Dr. Martin observed, "is largely fallacious for no pesticide will, in the long run, survive unless its use enables the grower to show a profit. The non-selectivity of present day pesticides is a defect which can be cured by the discovery and introduction of chemicals of greater specificity, but there are clearly limits to the degree of specificity which can prove economically sound . . . the third defect of selection of resistant strains is, I am afraid, insoluble, for it is part and parcel of evolution."

The continuous and widespread use of a single insecticide, Dr. Martin noted, will inevitably lead to the selection of insects resistant to it. "Three per cent nicotine dust has given way to five per cent dust or to another aphicide. Only to a limited though important range of insects has DDT become useless, and in spite of our ten years continuous use is still an insecticide of proven merit. But the DDT resistant fly appears to be an exceptional phenomenon, though its significance must never be belittled. Each individual pesticide should be watched for evidence that resistance to it will not develop to the extent and speed with which house flies resistant to DDT are selected. Meanwhile, ways must be found of countering this selection inevitable with a single method of pest or disease control. The chances of unwanted selection diminish rapidly with each additional control method. A complete mortality is unobtainable with but one insecticide, but it is of interest that in theory at least it should be possible to secure a 100% kill with a moderate concentration of two suitably contrasted insecticides. A judicious alternation of control methods should permit us to live comfortably with the selection problem."

FUTURE trends in the Canadian market for agricultural chemicals were forecast by D. K. Jackson, market research manager for Monsanto Canada, Ltd., who predicted that sales will double over the next five or six years. As compared with 1955 sales of $22,800,000, he suggested that industry volume will reach $47,000,000 a year by 1961. Currently, he noted, only about ¾ of one per cent of the farmer's income is spent on pest control chemicals and only one and one half per cent on fertilizers.

The speaker estimated insecticide sales currently at $3,300,000. DDT is still the leading pesticide, accounting for a sales total of $806,000 in 1955. Malathion has moved up prominently in the past three years and is now second on the list with a 1955 sales figure of $780,000. Mr. Jackson predicted a continuing expansion in insecticide use, and set the probable 1961 total at $5,300,000.

Fungicides for use on crops reached a value of $2,910,000 in 1955, with an additional $1,514,000 spent on seed treatments, largely fungicidal. The speaker suggested a continuing expansion in use, reaching the level of $5,100,000 and $3,900,000 respectively by 1961.

The star performer of the Canadian agricultural chemical industry has been herbicides. Sales for 1955 were estimated at $5,730,000 and it was predicted that the total here might reach $12,300,000 by 1961. With 2,4-D having started the sharp up-swing in herbicide use about ten years ago, the market even for this popular herbicide is still nowhere near saturation, Mr. Jackson suggested. This is particularly true for Eastern Canada where there are many more acres of unsprayed than there are of sprayed land. M.C.P. use has tripled in the past three years, mainly because crops like oats, flax and some clovers are more tolerant to it than they are to 2,4-D, while some weeds such as Canada thistle are more susceptible to it than to 2,4-D.★★

COMMENTS BY RIPPER

(*Continued from Page 48*)

Another practice increasing in popularity in England is the joint employment of an entomologist. In a small cooperative venture, several farmers form a company whose sole function is to hire an entomologist, who is responsible only to the 5 or 6 companies in the co-op. The entomologist makes regular investigations of the farms involved, recommending whatever control measures appear to be necessary. Dr. Ripper indicated that the trend seems to be toward "breeding a general agricultural expert, or "crop doctor." "★★

CONTROL OFFICIALS

(*Continued from Page 50*)

yet have so few casualties." He spoke on "Trends in Research on Chemicals for Control of Insects."

As the chief aspects of the hazard problem, he listed:

1. acute toxic effect to those applying and using pesticides.
2. product toxicity.
3. a possible upset in balance between destructive and beneficial insects.
4. resistance.

Much still remains to be done, however, Dr. Knipling suggested, giving the corn ear worm and the pink bollworm as examples of two unconquered insects. As a trend in pesticides, he reported that the present move is toward short-residue materials. He predicted far more attention in the future to research on long-range effects on wildlife, resistance, use of toxicants with attractants, and use of systemics.

Dr. E. G. Klarmann, president

of the Chemical Specialties Manufacturers Association, spoke on the "Relevance of Official AOAC Testing Methods on Disinfectants in Hospitals," calling for a change in hospital procedures. He urged pesticide control officials to study this problem more closely, as it comes within their realm of jurisdiction. W. B. Ennis, Jr., head of the Weed Investigations Section, USDA, declared that "too frequently weeds have been considered a necessary menace. "Weeds cost American agriculture an estimated $3.7 billion annually."

Commending regional weed conferences, sponsored by the Weed Society of America as a means of communication, he reported that there is still much work to be done on rangeland, pasturage, and vegetable crop weed control. He pointed out the trend toward development of materials for specific weed-crop situations, saying that this trend has increased use of herbicides in a number of crops.

Mr. Ennis reported on outbreaks in the Carolinas of a new and highly destructive corn weed, dubbed "witchweed." Microscopic seeds of this parasitic plant, which has resulted in incidence of 100% crop failure in corn, germinate only in the presence of a prey crop, and the seed can remain in the ground for 20 years.

He revealed that as early as 1952 33½ million acres in the U. S. were under chemical weed control, and that this total was more than the number under other forms of chemical pesticide control. As trends he foresaw increased use of herbicides in granular form, for forage crops, and against aquatic weeds in irrigation ditches and inland waterways.

After the formal program, the officials heard a number of committee reports. It was firmly resolved that the coloring of treated seeds be urged on the respective legislatures, and Mr. Lemmon proposed a resolution to include defoliants, desiccants, and nematocides in existing pesticide legislation. The committee on legislation reported that Delaware, Idaho, Indiana, Nebraska, and West Virginia have no pesticidal legislation, Illinois regulates only Paris Green, and Ohio is now considering certain pesticides in its Livestock Remedy Law.

H. J. Fisher, Connecticut, was elected new president of the organization; F. H. Gates, Colorado, vice-president; and A. B. Heagy, Maryland, was reelected secretary-treasurer. C. H. Jefferson, Canada, and C. A. Bower, Oklahoma, past president, were named to the executive committee.

Prior to adjournment, a panel discussion, moderated by R. H. Guntert, was held to discuss everyday procedures and problems in the enforcement of Pesticide Laws.★★

INSECT CONTROL

(*Continued from Page 65*)

expected to be generally higher than those in 1956.

Ips Beetles Build-up in Pine Areas of Texas and Arkansas

SERIOUS outbreaks of Ips beetles were reported from six east Texas counties in mid-October. Some areas have up to 10 pines per acre dying in these counties. Tree mortality is also being caused in other eastern counties. A build-up of these beetles has also been reported in the southern half of Arkansas, where mortality is occurring mostly in scattered single trees or small groups of trees.

Cooperative Range Grasshopper and Mormon Cricket Control—1956

FIGURES recently released by Plant Pest Control Branch show that a total of 2,061,854 acres were treated for control of range grasshoppers this past season, and 55,747 acres were baited for Mormon cricket. Range grasshopper control programs were carried out in 15 states west of the Mississippi River, with the greatest acreage treated being in New Mexico, where spraying was done on 674,614 acres; Texas was second with 282,565 acres. Due to the very erratic season, control was not conducted in Arizona until September when 114,789 acres were sprayed. Baiting for Mormon cricket was carried out in Colorado, Idaho, Nevada, Utah, and Wyoming, with the greatest acreage, 34,064, being in Utah.★★

PESTICIDE FORMULATORS

(Continued from Page 44)

used," he declared. He attributed reports of resistance in his state to poor application, wrong timing, or to use of inferior materials.

In a progress report on some of the research being done at N. C. State, Dr. Smith said that some of the most promising work is being done in biological control through studies of predators, parasites, and insect diseases that demnstrate selectivity for a particular pest.

Dr. George Ferguson, president of Geigy Agricultural Chemicals Co., New York, speaking on "New Developments in Herbicides," reported to the group on recent studies to discover materials that would show more and more selectivity for special crop weeds. "The current trend is definitely toward specific chemicals for a specific weed," he said, pointing out that it would require a great deal of more effective field service work.

He described how even herbicides and inhibitors are tending toward this selectivity, and how special materials are being developed for certain species of grasses, thistles, and other crop weeds.

Dr. Ferguson then went on to describe how his company researchers are using basic molecular structures as building blocks in their search for greater selectivity among the herbicides.★★

OIL CHEMISTS

(Continued from Page 93)

crease the water holding capacity of these soils?

(c) Why doesn't the selective addition of surfactant increase the water holding capacity of other specific soils?

(d) Why does the selective addition of surfactant to various crops on specific soils result in yield increases for some crops but not others?

(e) If the addition of a surfactant to a soil results in a significant elevation of the moisture content of that soil, why is it that the crops produced on the treated soil do not respond to the differential moisture during periods of moisture stress?

(f) Is the surfactant effect purely physical in nature or are we altering the physicochemical system?

(g) Does the use of surfactants affect only the process rate or does it alter the system of the process itself?

(h) Do connections exist between the functions of humates and soil organic matter and the functions of surfactants in the soil?

To his audience of oil chemists, Mr. Seymour declared that the revelation of the mechanisms of the functions of surfactants with specific soils and crops could feasibly be translated into handsome profits. "The potential is there," he said, "It is a challenge to the chemical profession."★★

WACA CONVENTION

(*Continued from Page 42*)

Mr. Banks said his department feels there is adequate water for present needs and future expansion provided the engineering work in conservation and distribution is carried through.

Allen F. Mather, executive secretary, Agricultural Council of California, representing 92,000 California farmers, discussed the problems of farmers relating to the agricultural chemicals field, observing that the foremost problem in the minds of California farmers is the drift of chemicals to adjoining properties in the course of application.

Mr. Mather also pointed out that the three chemical developments most needed in California are better weed control chemicals, more economical controls for nematodes and chemicals to eliminate infestations in dried fruit. He expressed the hope that these problems will be solved for the California farmers by agricultural chemical manufacturers in the near future, and pointed out the need for standardization of formulations used throughout the state.

Final event on the WACA program was the first Western showing of Shell Chemical Company's non commercial film — "Rival Worlds." The film was produced by Shell Petroleum Co. in England, and deals with insects as a world health problem. The film shows the control pattern of insects from ancient times until the present, with micro-photographs of insects featured. It is available through Shell Chemical Co. for showing to interested groups.★★

Granulation & Ammoniation

(*Continued from Page 37*)

garding its influence on granulation. The evidence so far is that it does not detract from the effectiveness of the usual granulating system.

Fumes and dust are the subject of much work in the industry and they are as much a concern from the standpoint of economic losses as of immediate safety and air pollution. Some plants face the expenditure of nearly as much for dust control as was originally spent for granulation.

Fires in fertilizer mixers continue to be a serious concern although it is gratifying to learn of the success many have had in controlling them once it was realized that control is possible.

In batch operations considerable control of fires as well as of dust and fumes is obtained by adding the muriate of potash after any acid is added and neutralized by the ammoniating medium. Some manufacturers use anhydrous ammonia separately but in the same formula with nitrogen solution and acid. Here the acid in batch operation can be prevented from acting on either the muriate of potash or the ammonium nitrate by withholding them from the batch until the anhydrous ammonia has neutralized the acid. Thereafter the potash is added and ammoniation with the nitrogen solution may proceed in the normal manner.

Some things which now are barely discernible in the firmament will doubtless be recognized as important developments perhaps even before this group meets again. Of the developments discussed, some of the following crept inauspiciously into the granulating industry while others have enjoyed the fanfare of a visiting fireman.

Consideration of the characteristics of materials that influence the granulating potential including the formation in the mix of additional products such as through the use of acid and possibly variation of temperatures.

Improving storage and application properties through more uniform particle size with emphasis on reducing the amount of coarse sizes and more uniform moisture content. Coating is under consideration for some cases.

Continuous operations including recycling, sampling and ammoniation.

Excess ammoniation at a calculated loss of ammonia without the use of acid.

The use of acid beyond the requirements for neutralizing the uncombined ammonia for the added heat and other influences on granulation.

Control of fires related to the use of acid.

Fumes and dust involving economic loss as well as air pollution.

Refinements of control by personal skills and instrumentation, particularly in the double granulating units which use only one mixer and ammoniator.

Means for delivering the highly ammoniated mass to the dryer at maximum temperatures by direct delivery from the ammoniator to the dryer, if necessary.

The use of materials for purposes other than for plant foods such as acid, steam and hot water.

Provision for drying under conditions that are more favorable to granulation than has existed where the dryer has been operated almost exclusively to obtain maximum drying capacity.

EDITORIALS

(*Continued from Page 31*)

absence of the "crop doctor" or paid entomological consultant.

Another helpful step by manufacturers would be to get their research men together more often in an attempt to achieve more uniformity in recommendations. Joint statements tend to eliminate confusion, as contrasted with each individual research worker giving out his own results independently. Conspicuous examples of this sort of activity are conferences such as the one instituted at Cornell University a number of years back, and the annual Cotton Conference held under the sponsorship of the National Cotton Council.

More of such meetings, continued attempts to educate the dealer, the custom sprayer and the county agent, and an increase in the number of field men to work directly with the farmer are urgently needed to

help agricultural pesticides realize their true potential.

FERTILIZER DEALERS

(*From Page 51*)

"and for that reason the industry must use discretion and taste in its advertising methods."

"You gentlemen are fortunate in having an industry that faces not the slightest hazard of becoming obsolete or out-dated. The fertilizer industry is great and growing, and has a distinct future in this country's and the world's economy."

Dr. E. R. Purvis, of the Rutgers Soils Dept., speaking on "Farming the Pine Barrens," told of vast unused land resources available, through use of agricultural chemicals, to New Jersey agriculture. He described the 200,000 acres of pine barren swampland in the southern section of the state, and various experiments conducted on tracts adjacent to this swampland.

"In a year of the worst water table in a long time, we obtained a tomato crop of 9½ tons to the acre, a corn crop of 100 bushels to the acre, and of summer squash of eight tons per acre." This was accomplished on land consisting of not much more than sand, proper amounts of fertilizer, and a constant water table, he pointed out.

In a preliminary to his main talk, Dr. Purvis reported that the New Jersey College of Agriculture contemplates no changes in grades of fertilizers recommended for next year. He did predict the recommendation of 0-1-3 for alfalfa in the near future, and the possibility of recommendations of a higher nitrogen requirement on grass forage and on some fruits.

Turf Culture

DR. Ralph E. Engel, of the Rutgers Farm Crops Dept., charged that there is far too much misinformation and too many fads and superstitions in turf culture. "Most states have done little or no work in this field," he said. "The chief needs in turf culture are a complete high phosphorus fertilizer, and a complete high nitrogen fertilizer."

He warned that excessive fertilization encourages disease, and that summer fertilization encourages crabgrass. "In general, I don't approve of summer fertilization at all, "he declared. "The best time to apply fertilizer is in early spring and in October, and the fall is the safest time to increase fertilization of any particular lawn.

Dr. R. P. Korbobo, of the Ornamental Horticulture Division of Rutgers Horticulture Dept., declared that a need for basic research also exists in the field of ornamentals. He too advised that trees and ornamentals be fed in early spring or October. "We have been advising two pounds of 5-10-5 per 100 square feet of soil surface."

Dr. Korbobo noted that a definite need exists for the development of specialized types of fertilizers and fertilizer techniques for trees and ornamentals. He stressed the tremendous new field of possible plant nutrient users as a result of the increased exodus to the suburbs.★★

INSECT PHOTO SALON

(*From Page 39*)

Winner of both first and second place in the color section was Frank E. Skinner, senior laboratory technician, University of California, Department of Biological Control, Albany, California. He used a Leica IIIc with Leitz reflex housing and bellows, and 16mm Micro Tessar f/4.5 lens. Illumination was from a Wabash Sylvania Electroflash Model R-1140 with 95 watt-second rating, and flash duration of 1/5000 sec. 35mm Kodachrome daylight film was used for both pictures.

These are part of a series of pictures taken over a period of several months to illustrate development of parasites imported for biological control of the olive scale.

Third place winner Dr. E. C. Klostermeyer, assistant entomologist, Irrigation Experiment Station, Pros-

ser, Wn. used a 35mm Praktica with 105mm Colinar lens on bellows extension. His light source was a Heiland Strobonar V electronic flash. Lamp heads were mounted on a bracket on either side of the camera. Lens aperture was f/11, with exposure 1/1000 sec. on daylight-type Kodachrome. Camera was hand-held, with lens set for a pre-determined magnification, the subject then being brought into focus by moving the camera, rather than the lens.

Honorable mention in color was by Charles H. Starker, entomologist, Pacific Supply Cooperative, Portland, Ore. who used a 35mm Exakta VX with 50mm Zeiss Tessar on bellows extension. Light source was a Heiland Strobonar V electronic flash. Exposure was 1/1000 on daylight-type Kodachrome, camera being hand-held and subjects feeding naturally on an apple tree.

LISTENING POST

(From Page 64)

conducted in the mushroom plant of West Foods of California in Soquel, California. Plots of 50 square feet of bed space were sprayed with Terraclor in concentrations of 100, 250, 500, 1000 and 2000 ppm. Although no records were kept of the yield, the plots were observed daily. The plots were sprayed after the mushrooms were picked off. The mushrooms which grew subsequently were not spotted or in any way impaired by the spray. As far as could be observed there was no decrease in yield, except possibly a small reduction at 2000 ppm. In smaller plots, the mushrooms were sprayed directly with 500 and 1000 ppm; no spotting occurred. Mushroom beds dusted after the first break with 20% Terraclor powder at the rate of 1 pound per 1000 square feet of space produced in some instances 2 pounds of mushrooms per square foot in 5 to seven weeks (cropping period). The mushroom spawn grew normally in houses where the bed boards were sprayed with 75% wettable powder of Terraclor at the rate of 1 pound per 100 gallons of water (about 1000 ppm). According to these results Terraclor is not toxic to mushrooms or spawn when these procedures are practised.

Experiments in spraying Terraclor on the casing soil gave inconclusive results for various reasons, but the data show the effect of Terraclor on the yield of mushrooms. On the basis of the single test it may be stated, tentatively, that Terraclor sprayed at the rate of 100 ppm immediately after casing the beds will not decrease the yield, but at 400 to 1000 ppm will reduce yields sharply. These results apply to spraying at the time of casing, and not to spraying after the mushroom mycelium has grown into the soil.

In another test, 50 and 100 ppm of Terraclor were mixed with the casing soil and used to case 24 square feet of bed surface. No records were kept of the yields from these plots, but there is little doubt that the crop was delayed and the yields reduced by even 50 ppm Terraclor mixed with the casing soil. Relatively few mushrooms grew on these plots. Evidently Terraclor should not be mixed with the casing soil.

In practical use, to control mildew, the bed boards may be sprayed with Terraclor (75% wettable powder) at the rate of 1 pound per 100 gallons of water (1000 ppm) before the beds are filled with compost. After the first break is picked off, the beds may be sprayed with 500 to 1000 ppm of Terraclor, or dusted with 20% Terraclor at the rate of ½ to 1 pound per 1000 square feet of bed space. Immediately after casing, the beds might be sprayed with Terraclor at the rate of 100 ppm. (Only one test as a basis for this suggestion). Spraying the soil immediately after casing with 400 ppm or more of Terraclor will result in a reduction in yield. Apparently the yield is reduced by mixing as little as 50 ppm of Terraclor with the casing soil.

These experiments with Terraclor were conducted with a peat soil containing 50% organic matter, and the results and conclusions apply strictly to a soil of this nature.

"HERBICIDES PAY OFF"

This four and one-quarter minute 16 millimeter sound-on-the-film movie is now available for general distribution through the NAC Association. Filled with startling facts and presented in a very interesting manner, the film depicts the numerous benefits derived from the use of herbicides.

The film has been produced for use on television or as a visual aid at meetings, forums and in talks. Instructors will find it a valuable aid in the classroom.

Requests for the film should be addressed to the Film Lending Library, National Agricultural Chemicals Association, 1145 19th Street, N. W., Washington 6, D. C.

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Whether the results are applicable to soil containing the usual 5% organic matter will have to be determined by actual tests. However, it seems reasonable to suppose that these results should apply to procedure after the first break of mushrooms.

Water of medium hardness was used to dissolve the chemicals, except in the one instance referred to in Table 1.★★

CATTLE TICKS

(*From Page 34*)

Blue tick control was less satisfactory with toxaphene. Toxaphene was found outstanding for control of bont tick, *Amblyomma variegatum*. This conclusion was confirmed by results of spraying experiments. Ticks attaching on the perianal area (marked Anal on table), were poorly controlled in all cases in the rainy season. Species involved were *Hyalomma transiens*, *H. rufipes*, and *Rhipicephalus evertsi*. Brown tick, *Rhipicephalus appendiculatus*, was most satisfactorily controlled by toxaphene in the important rainy season period. DDT was effective in the dry season. All observations agreed on the superiority of weekly dipping over fortnightly dipping, regardless of insecticide or season.

There is little doubt that a weekly dipping throughout the year in a high concentration of toxaphene would afford very good control of all tick species. Central African economics, unfortunately, will not pay for such a practise.

Intensive experiments were conducted during the rainy season on small groups of cattle given various treatments, but pastured together. All applications were made weekly. Table 2 presents the condensed data. Results confirmed the large herd conclusions of ineffectiveness of BHC and effectiveness of DDT against blue tick, and the over-all effectiveness of toxaphene. Under these conditions of high brown tick populations, none of the treatments were completely satisfactory. The application method comparisons demonstrated the superiority of a fresh dip over any spraying method. However, the short term of the experiment favored dipping, as dip fouling was not a factor — as it is in practise. The spray racing poor results must be attributed to the particular race used. Subsequent developments in spray race design have greatly increased efficiency of control. The difficult nature of Central African tick control is very evident from these data. Careful weekly treatment by the best insecticide and method (0.25% toxaphene hand spray) reduced the total tick count by 71%.

(*Conclusion next month*)

TABLE 2.

Rainy Season Insecticide and Application Method Experiment
Cattle Tick Totals of 6 Weekly Counts on 8 Animals.

Treatments	Rhipicephalus	Amblyomma	Boophilus	Total Ticks
Unsprayed	2901	560	191	5145
Hand Sprayed With:				
0.14% DDT	1750	105	5	2704
0.02% gamma BHC	1784	58	145	2692
0.17% toxaphene	1115	38	30	1993
0.25% toxaphene	833	30	32	1513
Averages According to Application Method:				
Unsprayed	2523	514	230	4448
Dipped	1107	68	17	1778
Spray Raced	1933	263	32	3191
Hand Sprayed	1467	71	17	2346
Pen Sprayed	1664	218	19	3055

TRACE ELEMENTS

(*From Page 35*)

Six elements are recognized at present as comprising the trace-element group; namely, iron, manganese, zinc, copper, boron and molybdenum. All plant species need these elements in varying degrees as nutritional elements. They are all indispensable in some physiological function, such as the synthesis of essential organic molecules (iron for chlorophyll), the buildup of enzymes or of co-enzymes. If the element is not present, the function is not performed. Other elements including aluminum, chlorine, sodium, iodine, and silicon not listed in the group can influence the growth and health of some but not all plants.

A deficiency in one of the trace elements affects the physiology and can be recognized in many cases by visual diagnosis—the so-called "hunger signs." It is not a disease but a case of insufficient nutrition. When the affected plant is treated with the deficient element its physiology is normalized. The growth and metabolism of all living organisms call for a great variety of functions by many chemical elements acting in concert to perform balanced chemical processes. It is a very complex performance. Intensive research over many years has elucidated some of this complexity but, as previously mentioned, our knowledge of it is limited. Some evidence supports the following very brief information about the functions of elements in plant life:

Boron: Needed to permit calcium to do its job in the metabolism; is essential in other processes, and prevents such "diseases" as cracked stem of celery, internal cork of apples, black heart of beets and turnips, and yellowing of alfalfa leaves.

Cobalt: A constituent of vitamin B12 and in mammals is essential for hemoglobin formation in the blood.

Copper: Acts as a catalyst or part of enzyme systems, helps produce more dry matter through stimulation of growth and prevents development of certain kinds of chlorosis, rosetting, and dieback.

Iron: Indispensable as carrier of oxygen in the process of biologic oxidation, needed in production of chlorophyll, aids in preventing chlorosis. Recently, iron mixed with chelating agents has given superior results on acid soils.

Manganese: Aids the oxidase enzyme to carry oxygen, enters into oxidation and reduction reactions, needed in carbohydrate metabolism and in seed formation and growth and helps overcome chlorosis.

Zinc: May act in the formation of chlorophyll and prevents chlorosis in some plants, stimulates plant growth and prevents the occurrence of mottled leaf in citrus, white bud in corn and other disorders.

Molybdenum: Is concerned with the metabolism of nitrogen involving the reduction of nitrates in the synthesis of amino acid and protein and for bacterial activity in legume root nodules. The content in soils is always small and deficiencies appear when the pH is below 5.2.

One characteristic of the trace elements needs emphasis: applied in excessive amounts in a soil or as a spray, they can be toxic to plant life.

The foregoing should make it clear that trace elements deserve very careful study, that their essentiality in plant and animal life is indisputable, that our knowledge of how they fit in and work with other elements in physiological processes is all too limited, and that current usage is mostly empirical. However, the favorable results obtainable with them even on the basis of this empiricism justifies the anticipation that future research will be richly rewarded.★★

FERTILIZER PHOSPHATES

(*From Page 46*)

phate rock and bone) are to be avoided; if used they should be applied during a humid period or wet season to facilitate their solubilization.★★

Literature references

1—Doughty, Soil Sc. 1935. t. 40, p. 191
2—Boischot & Huriez, *Bull. Soc. Sc. de Bretagne*, t. XIX, 1943
3—Schloesing, *Ann. Sc. Agr.* 1899, p. 316

4—Boischot & Huriez, C. R. Ac. Agr. 1943, p. 481
6—Barbier, Chabannes, Miallet, Ann. C. R. Ac. Sc. t. 230, p. 595
5—Demolon, Boischot, Melle Tyskiewicz, Agr. 1946, p. 7-33
7—Boischodt, Coppenet, Herbert, Ann. Agr. 1949, p. 103
8.—Schloesing, C. R. Ac. Sc. t. CXVIII, p. 1004-1899
9—Demolon & Boischot, C. R. Ac. Agric. Sc. t. 176, p. 777, 1923
10—Sanourche & Henry, C. R. Ac. Agric. t. 19, p. 64, 1933
11—Boischot, Ann. Agr. 1934, p. 77
12—Coppent, Boischot, C. R. Ac. Sc. t. 227, p. 1166, 1948
13—Boischot & Chabannes, C. R. Ac. Agr. 1948, p. 994
14—Boischot & Melle G. Sylvestre, C. R. Ac. Sc. t. 229, p. 595, 1949
15—Barbier & Chabannes, Ann. Agr. 1949, p. 343
16—Demolon, Ann. Sc. Ag. 1923, p. 151
17—Trocme & Barbier, Ann. Ag. 1949, p. 261
18—Barbier & Marquis, Ann. Ag. 1944, p. 409
19—Boischot & Drouineau, Ann. Agr. 1938, p. 57
20—Demolon & Boischot, D. R. Ac. Ag. 1950, p. 711
21—Mehlich-Truog-Fred, Soil Sc. 1934, 38, p. 457.

ENTOMOLOGY RESEARCH

(*From Page 53*)

grubs, ticks, lice, and other external parasites also offer great possibilities.

Another area of chemical control that deserves far more consideration than has been given to it is the use of attractants in combination with toxicants. The progress that has been made in meeting the insecticide-resistant fly problem by combining attractive fly foods with fly toxicants is an example of the merits of this approach to insect control. The success of the protein hydrolysate bait sprays for controlling the oriental, Mediterranean, melon, and Mexican fruit flies is another outstanding example of the value of attractants in insecticide programs.

The use of a combination of attractants and toxicants should greatly reduce the residue hazard. It might also make insect control possible without serious harm to beneficial parasites, predators, and honey bees. Our Branch plans to do much more research on attractants. Our objective is to strengthen basic research on nutritional requirements of insects and on the nature of sex and other attractants.

The importance of applying chemicals that do a minimum of harm to beneficial insects has already been stressed. Other phases of research relating to biological control that need more attention include further exploration for insects to control noxious weeds. We believe that more attention should be given to biological-control work in the future. A special effort will be made to strengthen research on insect pathogens. More basic information will be obtained on the type of disease organisms that will give biological-control of destructive pests. The most promising organisms will be investigated in order to develop methods of culture and to learn how to employ them in actual control operations.

I have already indicated that the use of plant varieties that resist attack is the ideal way to control insects because of the low cost and the avoidance of toxicological and residue problems and adverse effects to beneficial insects. Every effort will be made to strengthen research in this area of insect control. It is generally agreed that from 5 to 10 years are needed to make substantial progress in developing new plant varieties. We are hopeful, however, that we can join with plant breeders and other specialists in an expanded long-range program.

Other areas of research need to be maintained or expanded in the years ahead. Emphasis on new insecticides has resulted in the neglect of much work on the biology, ecology, and morphological relationships of insects. There is an urgent need for more basic information on factors

causing fluctuations in insect populations. One of the greatest services that the entomological profession can render is to determine for the grower how and when to employ the insect-control tools we have. We must be in a better position to make long-range forecasts of outbreaks and to appraise the significance of an insect population in terms of potential damage to a crop. Some day we should be in a position to inform the grower when control measures should be applied and when they are unnecessary. Increasing costs of crop production demand that maximum yields be obtained at minimum cost. To make substantial progress in this direction, we need extensive and intensive research on methods of insect survey and detection, economic effect at different levels of infestation, effect of climate, host relationships, interrelationship of the insect and biological control agents and other factors.

Much progress has been made in insect control, especially during the past decade. We have many good tools to work with. Some of these tools need to be redesigned and sharpened, and others need more skillful use if we are to overcome or avoid some of the current obstacles. I am confident, however, that we are beginning to see what roads to follow for greatest success in our continuing effort to find new and better ways to control insects.★★

FERTILIZER VIEWS

(*From Page 60*)

tilizer industry for promoting the health and vigor of plants, livestock and humans.

That N/P Ratio

REFERENCE has frequently been made in this column to the influence of nitrogen on the uptake of phosphorus and vice versa. Your attention is directed to a broad study of this subject which should be known to all interested. It is reported in Bulletin No. 453 (Nov. 1955) issued by the South Dakota Agricultural Experiment Station. This study comprises research of many years work by the Phosphorus Group of the North Central Research Committe, the group representing Illinois, Indiana, Minnesota, Nebraska, South Dakota, North Dakota, Wisconsin and U. S. Department of Agriculture. It is obvious the research thus sponsored was comprehensive, carefully conducted and is worthy of serious consideration.

Only a brief digest of the important conclusions can be given in this limited space. The objectives were: to evaluate the effect of nitrogen and potassium fertilizers on the availability of fertilizer phosphorus; study the effect of level of potassium and nitrogen content of the soil on the yield and phosphorus uptake by crops; determine the effect of placement of nitrogen and potassium on phosphorus utilization by various crops; and determine the mechanism by which one nutrient may affect the uptake of another nutrient by crops. The use of radio-active phosphorus was indispensable in elucidating these relationships.

Fertilizer nitrogen added in the soil area in which phosphorus was applied greatly aided in the uptake of fertilizer phosphorus, as shown by the higher percentage of phosphorus in the plant derived from the applied fertilizer, and in the recovery of the applied phosphorus. The percentage increases of the phosphorus in close-grown crops ranged from 10% to 107%; the increase with row crops ranged from 6.4% to 220%. These values are in comparison with no nitrogen or with nitrogen applied separately.

An increase in the rate of nitrogen application resulted, in all cases, in a progressively increased utilization of the fertilizer phosphorus.

The phosphorus of nitric-phosphates and dicalcium phosphates was utilized less than that of other phosphatic carriers studied.

This research should help correct some misconceptions about plant nutrient behavior and the interrelationships of nutrient ions to one another when present in the root zone.★★

PROFESSIONAL *Directory*

ALVIN J. COX, Ph.D.
Chemical Engineer and Chemist

(Formerly Director of Science, Government of the Philippine Islands. Retired Chief, Bureau of Chemistry, State of California, Department of Agriculture.)

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"Expanding agricultural chemical company has opening for experienced entomologist interested in product development and technical sales. Opportunities for advancement. Salary open. Send record of experience and education to Agricultural Specialties Co., 10219 Denton, Dallas, Texas."

R & H Appeals Patent Decision

An appeal was filed last month by attorneys for the Rohm & Haas Co., Philadelphia, from a decision by the Federal District Court of West Virginia in the company's patent infringement suit against Roberts Chemical Co. The court recently entered an order which held invalid the patent under which Rohm & Haas Company sells its Dithane brand fungicide.

"Our confidence in the validity of our patent is unshaken by this decision," said D. S. Frederick, Rohm & Haas vice-president. "We believe we were right in suing to enforce our patent. In authorizing our counsel to appeal, we feel we have taken a proper and necessary step, not only in the protection of our own interests but also of the interests of our distributors and dealers."

•

Spivey, Smith-Douglass Mgr.

Smith-Douglass Co., announced last month that Russell Spivey, manager of the Smith-Rowland division of Smith-Douglass, had joined the parent company as fertilizer sales manager for the Norfolk branch. At the same time, L. Gavaza became manager of the Smith-Rowland division.

In his new position, Mr. Spivey assists Mills W. Darden, Norfolk branch manager and Smith-Douglass director. He succeeds Earle I. Greene, who resigned recently.

LEGAL NOTICE

Statement of ownership, management, circulation, etc., required by the Act of Congress of August 24, 1912, as amended by the Acts of March 3, 1933, and July 2, 1946 (Title 39, United States Code, Section 233).

Of Agricultural Chemicals, published monthly at Baltimore, Maryland, for October 1, 1955.

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Signed—Eleanore Kanar, Editor

Sworn to and subscribed before me this 19th day of September, 1956.

(SEAL) John S. Throckmorton

(My commission expires November 6, 1956).

Forest Fire-Fighting Aid

"Firebrake," a chemical aid to combat forest fires, was recently introduced by the United States Borax & Chemical Corp., New York, after several years of testing. It is a sodium-Calcium borate preparation mixed in water at a ratio of four to six pounds per gallon, producing stable suspension. During California's recent forest fire outbreak it was applied from low flying crop duster planes and reportedly proved itself an efficient suppressant and retardant in the containing of the fires.

•

Janis is Janes

The article on "The Safe Application of Aromatic Petroleum Solvents in Agricultural Sprays," appearing in the October issue of *Agricultural Chemicals* (p. 42-44), was written by M. J. Janes, Socony Mobil Laboratories, Brooklyn, N. Y. Mr. Janes' name appeared incorrectly as Janis.

Assn. of Official Agricultural Chemists Meets

K. D. Jacob, president of the Association of Official Agricultural Chemists, announced the establishment of the Harvey W. Wiley Award for analytical methods at the 70th annual meeting of the association at the Shoreham Hotel, Washington, Oct. 15-17. The award, honoring the founder of the Pure Food and Drug Law and one of the association's founders, will be presented to the scientist or group of scientists who make an outstanding contribution to development of methods of analysis of foods, fertilizers, pesticides, soil, feeds, drugs, or cosmetics.

The AOAC meeting's general theme emphasized the application of modern methods of analysis to the enforcement of the nation's laws regulating composition and labeling. It was held in cooperation with the Food and Drug Administration, Department of Health, Education, and Welfare, and the Meat Inspection Branch, USDA.

Among the papers presented was "Report on Phosphorus in Fertilizers —Mechanical Analysis of Phosphate Rock," by K. D. Jacob and W. M. Hoffman of the fertilizer and agricultural lime section, Soil and Water Conservation Research Branch, USDA. The authors reported that "Wet sieving of the Florida soft phosphate with colloidal clay was facilitated and the precision and accuracy of the results were improved by the use of a dispersing agent consisting of sodium hexametaphosphate and sodium carbonate, but the dispersing agent was of practically no benefit in the wet sieving of ground phosphate rock." The researchers generally found best results obtained with a combination of wet and dry sieving method.

In their "Report on Nitrogen in Fertilizers," H. A. Davis and S. R. Miles found that the "Ford reduced iron method" gave higher results when applied to the high chloride-nitrate ratio containing fertilizers than the official method now in use. They stated that the average difference between results obtained by th two methods was significant at the 5% level, but not at the 1% level.

•

Unveil New Spray Airplane

The Transland Co., Torrance, Calif., recently unveiled its new aircraft which is reported to be the first designed specifically for aerial application of agricultural and forest lands. Named the Ag-2, the plane is designed for short take-offs, and is equipped with a special multi-tank arrangement with a 250 gallon capacity, and a 53 foot cubic liquid tight hopper.

The plane's tanks are located in the wings. Other equipment includes agitator gate, spreader, engine driven pump, valves, and spray booms. The company says that the Ag-2 can operate safely at high elevations, high temperatures, on short runways and over and around high obstructions.

•

New Hudson Multiwall Closure

An automatic valve closure which is reported to practically eliminate sifting in multiwall bags has been developed by Hudson Pulp & Paper Corp. for exclusive use in its sewn-valve multiwall sacks. Known as the Seal-O-Matic Sleeve, Hudson's valve closure is designed to give protection against sifting, and is said to be effective in the loading of dozens of products, such as fertilizer, chemicals, resins, cement and lime.

A CORRECTION

On page 101 of the October issue of *Agricultural Chemicals*, the statement that the Food and Drug Administration had announced that no tolerances are needed for piperonyl butoxide and pyrethrins in meat and milk was in error. The Food and Drug Administration has not made such an announcement. The view expressed was that of the Fairfield Chemical Division and was based on the absence of residues in samples of muscle, fat and milk from cattle that received Pyrenone sprays for a prolonged period.

•

Stewart Joins Grand River

The Grand River Chemical Division of Deere & Co., Tulsa, Okla. appointed Tom H. Stewart as technical service manager. In his new post he will provide technical service to fertilizer manufacturers in connection with the company's new line of nitrogen products. Previous to his Grand River appointment, Mr. Stewart was with the fertilizer division of International Minerals and Chemical Corp.

•

St. Regis Paper Selector

A paper selector for multiwall paper bags, in a convenient slide rule form for easy reference, has been designed by St. Regis Paper Co., New York. With the selector, it is possible to determine the type of paper best suited to meet individual multiwall bag packing requirements.

Information is provided on such topics as the type of protection offered by multiwall bag papers, the properties of multiwall bag papers, a description of the various types of papers and a representative list of the products using particular plies. By utilizing the slide rule format, it is possible to select any multiwall bag paper and quickly find its properties, a description of its construction, and its present product packaging applications.

The selector indicates which papers will provide protection against grease and oil, acid and alkali, scuff and abrasion, bacteria and insects, moisture vapor and water damage.

•

Samuel Allen Dies

Samuel G. Allen, chairman of the Combustion Engineering Co., New York, died Oct. 16 in Pinehurst, N. C. He was also a director of the Franklin Railway Supply Co., Warren, Pa., and had formerly served as chairman of the Lima-Hamilton Corp.

Index to ADVERTISERS

Tale Ends

IN Arizona, state officials are taking a sharp look at crop dusters, and moving to examine their qualifications. They are being checked to see if they have the right equipment and adequate know-how to handle application of highly toxic pesticides. Officials too are reported to be considering a requirement to make purchasers of certain pesticides register. Both moves are part of the pattern to minimize fatalities resulting from hazardous handling and unskilled application of toxic chemicals by spray or ground applicators or by the farmer himself.

AC

The above emphasizes the importance of and the need for a better informed group of crop dusters and aerial applicators. While the industry has come a long way since returning army hedge hoppers turned with no special training to aerial application of pesticides after World War II, often with unfortunate results, there is still much to be done. Custom spraying today demands a knowledge of how to handle safely the highly toxic materials often employed, what periodic medical check-ups are necessary and what immediate precautions should be observed when spray programs don't go exactly according to plan.

AC

Progress in this field may be anticipated for the future through the activities of the National Aviation Trade Association, Washington, D. C. Some of the top factors in the aerial application field are members of this group which is capably directed by Charles A. Parker. Unfortunately the small operators are often much more in need of advice and education, and it is just these applicators who need help most to keep them and others out of trouble who think they can't find the time for association activities, — or even time to read a trade paper.

AC

"Grub" Leonard reports that he is right back on his feet after the appendectomy which kept him away from the annual meeting of NACA at Spring Lake. As Grub tells it, "I had my white shoes all polished up for the annual Spring Lake soire, when a couple men in white with long, sharp knives tossed in a road block. And so to the white table and the extraction of a busted appendix. Incidentally I have same appendix all nicely bottled, and if I can get out to San Francisco with it next spring, perhaps I can get the Miller Bill experts to establish a tolerance for me."

AC

UNICEF (United Nations International Childrens Emergency Fund) has upped its buying program on DDT and has also requested a speed-up in deliveries. They are apparently anxious to get their full requirements on hand for shipment abroad as promptly as possible in view of the Suez situation and the uncertainty of deliveries by sea over the coming months. Earlier in the year, about July, contracts were given out for some six million pounds of DDT. More recently additional bids have been requested. The net result has been a very substantial reduction in carryover stocks of DDT following the close of the domestic 1956 application season.

AC

Overheard at the CACA convention in Niffles: MCP is proving superior to 2,4-D for application to oats on Canadian farms. It is reported to give comparable control without the occasional damage to crop which accompanies DDT use. Why hasn't MCP come into general use in the U. S. market? The answer probably is that while it gets into Canada duty-free, it faces a substantial tariff barrier which it must surmount to invade the U. S. market.

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